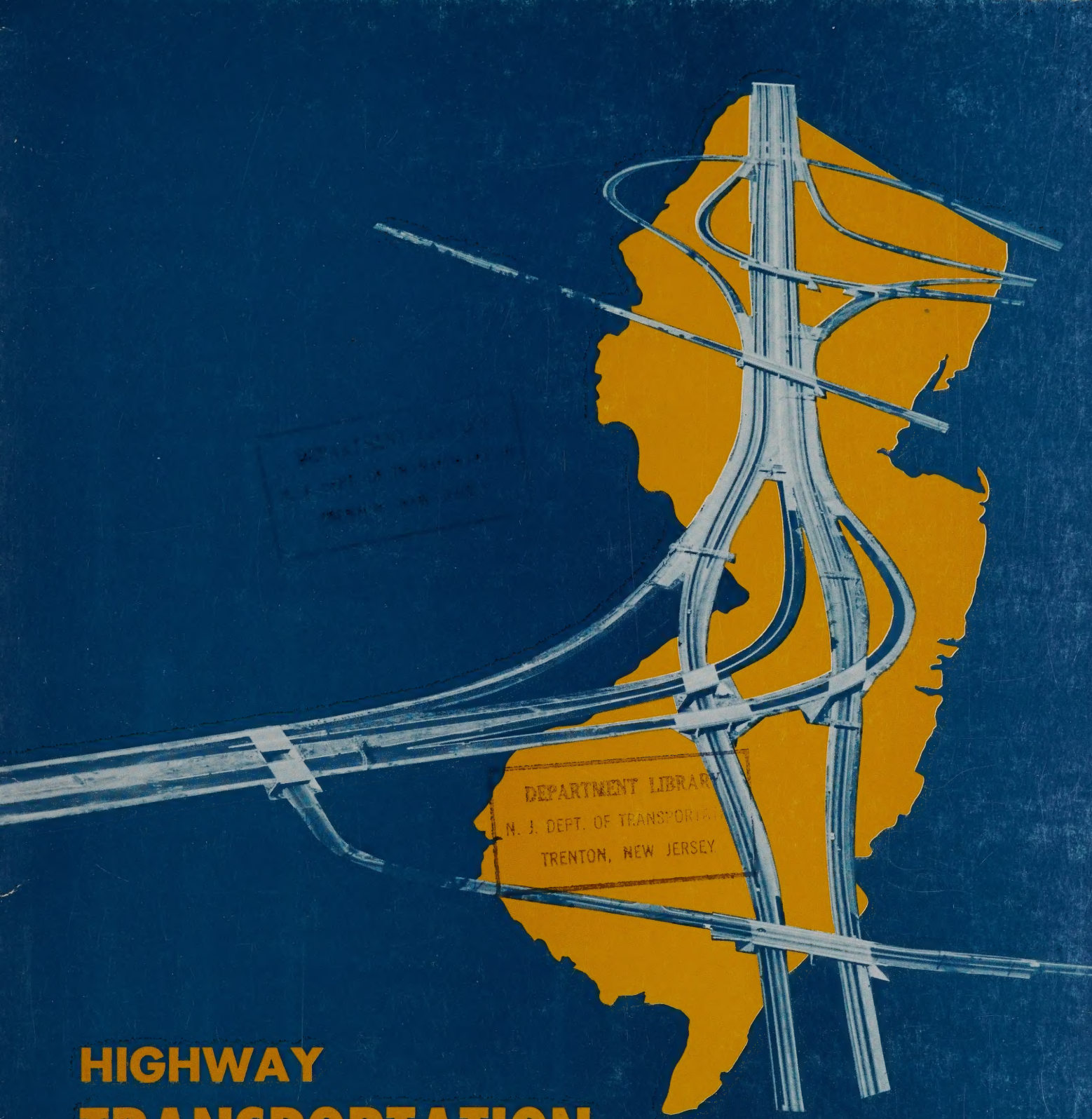
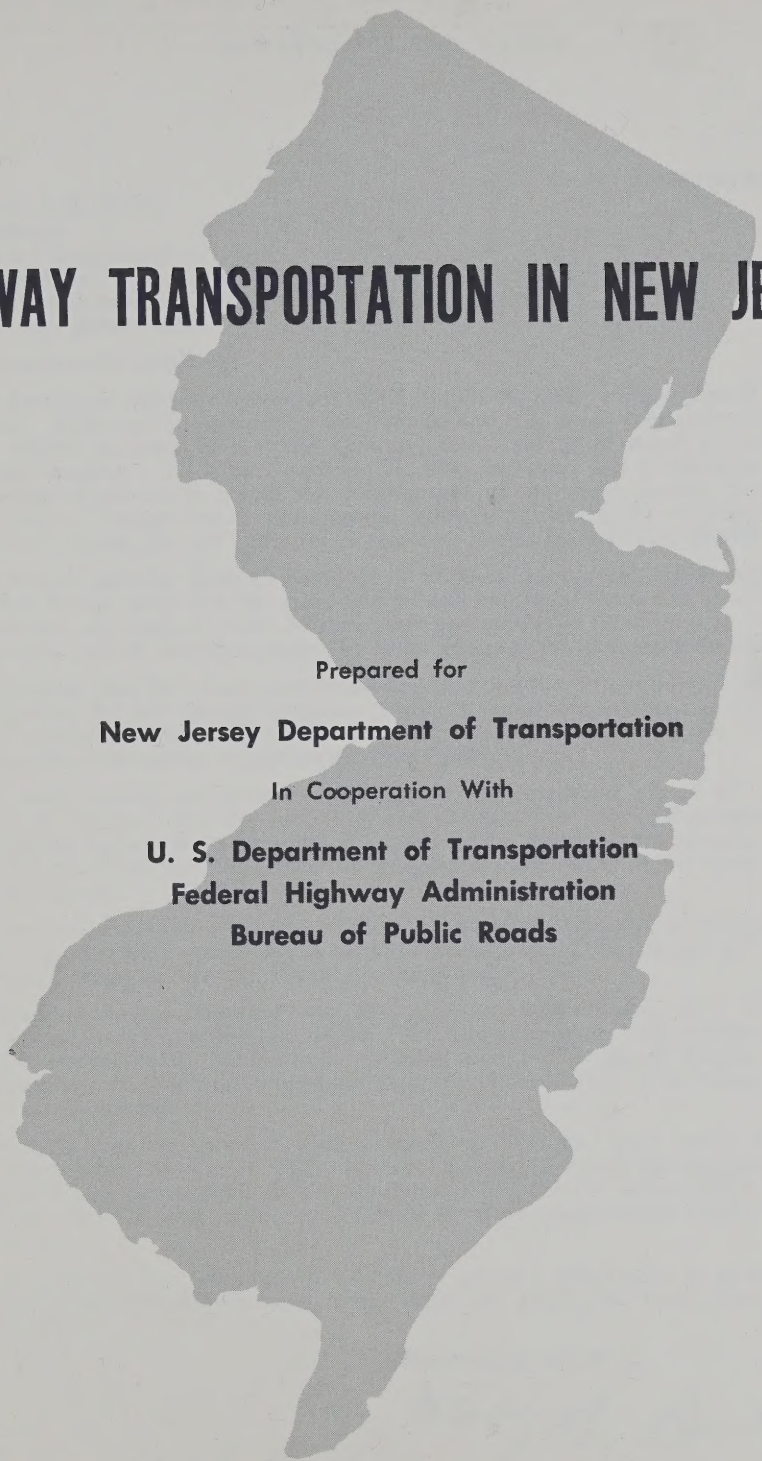


HIGHWAY TRANSPORTATION IN NEW JERSEY

PREPARED FOR NEW JERSEY DEPARTMENT OF TRANSPORTATION

Wilbur Smith and Associates

HIGHWAY TRANSPORTATION IN NEW JERSEY



Prepared for

New Jersey Department of Transportation

In Cooperation With

U. S. Department of Transportation
Federal Highway Administration
Bureau of Public Roads

By

Wilbur Smith and Associates

MARCH 1968

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Bureau of Public Roads.

Wilbur Smith and Associates, Inc.

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March 5, 1968

Mr. David J. Goldberg
Commissioner
New Jersey Department of
Transportation
1035 Parkway Avenue
Trenton, New Jersey 08625

Dear Commissioner Goldberg:

In accordance with our agreement dated March 30, 1966, we are pleased to submit our report, *Highway Transportation in New Jersey*. The study was authorized to perform an analysis in depth of the total highway, road, and street needs in the state for the period January 1, 1967, to December 31, 1986, inclusive, and to formulate programs and recommend policies to permit the development of the entire system to meet New Jersey's highway transportation requirements adequately during the 20 years. Costs of the 20-year program for all highways, roads, and streets total $11,743,904,000.

The report presents findings based on a complete survey of present highway conditions and future needs for the state, county and municipal roads and streets. A thorough analysis was made of New Jersey's economy, especially in relation to its transportation system, and of the roles played by other modes in the total transportation network.

We believe that the report represents the best possible projection of highway needs in New Jersey for the 20-year program period. It should be emphasized, however, that highway requirements are only one facet, albeit the most important one, of the ultimate transportation system requirements of the state.

The study results are presented for three improvement periods of 10, 15, and 20 years. It is believed that the most feasible program for the modernization of the State Highway System is that presented in the 15-year improvement analysis, while the county and municipal systems should be programmed for total improvement over the full 20-year period.

Recommendations for financing of the state highway improvement program and the allocation of additional state funds toward the realization of the county and municipal improvement programs are considered practical and realistic.

Although only one financing program has been recommended, it is obvious that there are many other possible approaches. The Department of Transportation has made a separate evaluation of this financing problem and has prepared definite proposals, emphasizing the need for an immediate program of somewhat lesser magnitude than we have recommended.

The study was conducted in close cooperation with the New Jersey Department of Transportation's Division of Planning and Division of Local Government Aid, and the United States Department of Transportation. We wish to acknowledge the invaluable advice, counsel, and assistance rendered by these organizations during the course of the study.

It is believed that the report will be of primary importance in developing the state's total transportation system of which highways, roads, and streets occupy such an important place.

Respectfully submitted,

Wilbur S. Smith

Registered P. E.
New Jersey No. 10470

Wilbur S. Smith

Report in Brief

New Jersey's substantial economic position in the rapidly-growing Northeast Corridor has been influenced considerably by its existing varied and complex transportation system. The system's facilities range from large, deep-water ports to one of the largest and busiest commercial airports in the nation. **However, the highway, road, and street network of the state is the basic and most vital of these modes — one that links together all sections of the state, the region, and the nation.**

The future healthy growth of the state's economy is highly dependent on an adequate transportation system. Such a system includes a highway network complemented by other transport modes, thus affording a balanced approach to the state's complex transportation problems.

Growing awarenness of the dependence of future economic growth and viability on adequate transportation in New Jersey resulted in a Department of Transportation decision to authorize a comprehensive study of highway needs and fiscal capabilities. This study provides a realistic evaluation of the impact of an expanding economy on highway requirements. Moreover, it supplies the information and engineering data required to determine the cost of various improvement projects and recommended financing programs. Included are studies of the economy, highway classification, highway needs, and fiscal requirements.

As noted in the 1968 Highway Needs Report recently transmitted to Congress by the U. S. Department of Transportation, **the major highway transportation problems in the next two decades will be in urban and urbanizing areas. This statement of highway transportation problems applies particularly to New Jersey, both now and in the future.**

In achieving the goal of an adequate highway network, the state and local governmental units are faced with the problem of satisfying 1986 transportation pressures engendered by:

A population of 9,975,000 people — up 44.6 per cent over 1966.

An urban population that in 1960 totaled 88.6 per cent of the state total, and which will become even more urbanized by 1986. It is estimated that no county will have fewer than 200 persons per square mile by that time.

A total of 5,280,000 registered vehicles — an increase of 68.6 per cent over 1966.

Annual travel of 65 billion vehicle-miles — up 88 per cent over 1966.

Assuming that the highway network of the state was adequate at present, the state would be faced with a rather significant task in meeting future demands. However, the plain facts are that, over a long period, a major portion of the network has become inadequate due to a combination of tremendous growth in travel and an insufficient level of available funds. Therefore, the task of providing a highway system fully capable of meeting future demands has been multiplied many times. *The task of providing an adequate highway network for the future will be monumental in size and complexity but fully within the fiscal capabilities of the state and local governments. Realization of this goal, however, is wholly dependent upon the public's desire for adequate transportation translated into meaningful legislation.*

The distribution of the state's population has an extremely important bearing on transportation needs. The propensity of industrial plants and commercial enterprises to seek sites in the suburban areas does not appear to be abating. Yet, the central business districts of the state's metropolitan areas still represent a tremendous concentration of economic activity.

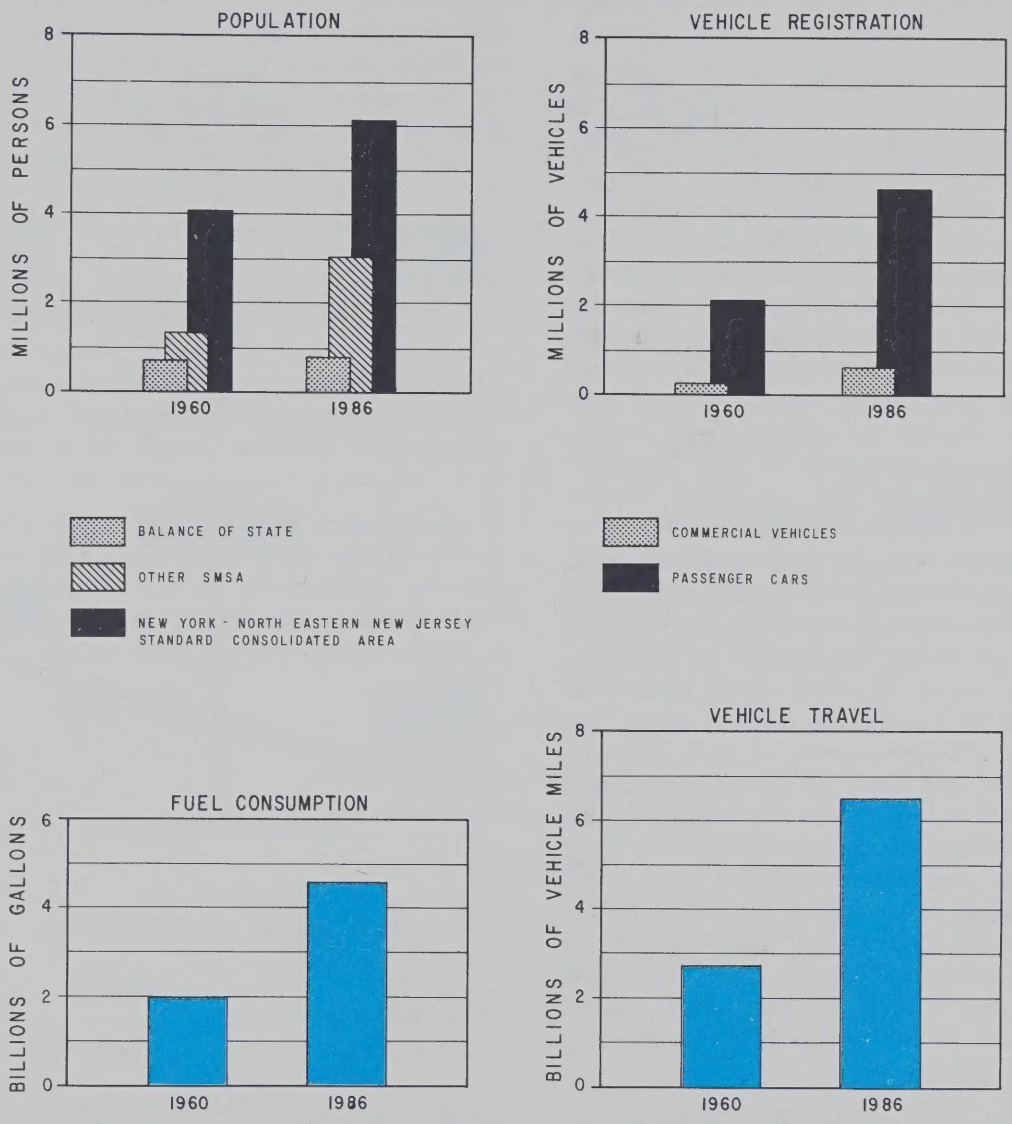
Highways, in a sense, do not automatically cause economic expansion. Rather, they affect the channeling of land development and help satisfy needs created by population increases, industrial expansion, underdeveloped material resources, or unused human resources. Where conditions are favorable for economic expansion, highways can provide the necessary economic stimuli.

The location of industries on improved highways makes it possible to increase accessibility to sales areas, labor markets, supplies, and raw materials. Good accessibility may also increase the amount of land available for productive use by opening new areas or by converting occupied land to higher use.

In addition, improvements in highway transportation reduce the costs of marketing products in areas where decentralization has widened many market areas. Efficiencies have also been effected by the locating of plants in areas where adequate land can be acquired at reasonable costs.

Employees commuting over improved highways benefit from reductions in operating costs, accident costs, time costs, and driver strain. Good transportation also permits added flexibility in selection of home sites.

The economy, speed, and flexibility of highway transportation has been a major factor in the past economic development of New Jersey. It will be an even more important force in the future.



GROWTH TRENDS

POPULATION, MOTOR VEHICLE REGISTRATIONS, MOTOR FUEL CONSUMPTION AND MOTOR VEHICLE TRAVEL

NEW JERSEY

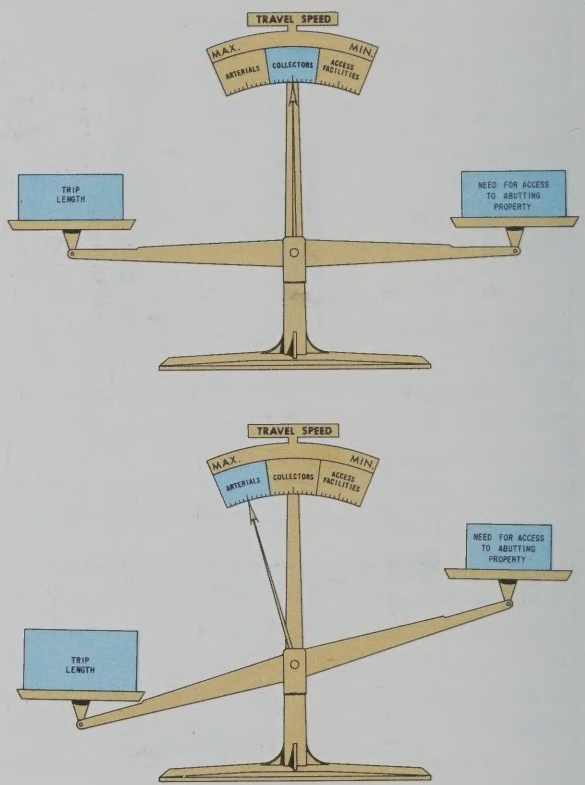
Wilbur Smith and Associates

HIGHWAY SYSTEMS

Functional classification of all highways, roads, and streets represents the key phase of the determination of highway needs. Functional classification is the assignment of highways, roads, and streets according to the character of service provided by each facility in its relationship to the total network. Such assignments provide the base from which sound engineering cost appraisals and fiscal planning can be made with a reasonable degree of confidence and reliability.

Classification by Administrative Systems

The highway network of New Jersey is administratively classified into three levels — state, county, and municipal. As of January 1, 1967, this network totaled 33,161 miles of highways, roads, and streets, of which 14,742 miles were considered rural and 17,567 miles as urban. The remaining mileage consists of toll highways (370.3 miles) and forest, park, and institutional roads (481.2 miles). Under the administration of the Department of Transportation were 1,972 miles. The county system totaled 6,740 miles. The municipal street system, by far the largest system, totaled 23,597 miles. The magnitude of this latter system reflects the highly urbanized characteristics of the state's population. Almost 12,000 miles of this system were classified as residential streets.



CONCEPT OF FUNCTIONAL CLASSIFICATION

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• By 1986, additional facilities needed to adequately handle the anticipated traffic demands will increase the total network to over 43,000 miles, *a gain of almost 10,000 miles.* The state highway system is expected to increase by 850 miles, of which 456 miles will be of limited access design, highlighting the state's critical need for high-type facilities. The county system will change very little in total, but the character of the system will change drastically with over 1,100 miles shifting from rural to urban classification during the program period. The municipal system will increase by 9,060 miles with almost all the growth accounted for by urban streets. Over 3,200 miles of this system will shift from rural to urban designation, again emphasizing the rapid changes within the state's economy.

Classification by Administrative and Functional Systems

● In the determination of functional classification for all roads and streets, there are three basic characteristics of highway service to consider — arterial, collector, and local access. This nomenclature has been assigned to delineate the *predominant* character of the facility's function. At one end of this spectrum is the concept of mobility; at the other, access to property. Rarely will a single facility serve only the access function or the mobility function. Arterials principally serve major traffic volumes on relatively long trips and their predominant character can be considered mobility. Local facilities provide access to property as a principal function.

● The three basic functional characteristics of service have been further subdivided to achieve a more detailed and precise evaluation of needs. The several functional classifications have been derived to meet the varying characteristics of total traffic needs, to permit a realistic application of design criteria, and to permit the recognition of unique financing programs. Arterial facilities include Interstate, major and area service highways, and primary thoroughfares. The collector category comprises collector highways and secondary thoroughfares. Access facilities include land access roads and commercial and residential streets.

● The end product of functional classification procedures is the assignment of functionally classified highways, roads, and streets to administrative jurisdictions. The recommended administrative assignments result in a 1986 state highway system totaling 2,436 miles. This system would include all freeways and major highways plus a substantial mileage of area service highways. The recommended county system of 3,534 miles would include all collector highways. The municipal system of 36,253 miles includes a substantial mileage of primary and secondary thoroughfares, commercial streets, and 24,642 miles of residential streets.

HIGHWAY AND STREET MILEAGE
BY ADMINISTRATIVE SYSTEMS

New Jersey

January 1, 1967

SYSTEM	*MILEAGE*	*PER CENT OF TOTAL*
State Highways	1,971.9	5.95
County Roads and Streets	6,739.9	20.33
Municipal Roads and Streets	23,597.3	71.16
Toll Highways	370.3	1.11
Forest, Park, and Institutional Roads	481.2	1.45
TOTAL	33,160.6	100.00

FUTURE FUNCTIONAL CLASSIFICATION AND ADMINISTRATIVE SYSTEMS

New Jersey

1986

FUTURE FUNCTIONAL CLASSIFICATION	*STATEWIDE SYSTEM*			
	State	*County*	*Municipal*	*Total*
Toll Highways	370.3[1]			370.3
Forest, Park, and Institutional Roads	481.2			481.2
Subtotal	851.5			851.5
Rural				
Interstate Highways	145.1			145.1
Class I Major Highways	193.2			193.2
Class II Major Highways	226.0	25.4		251.4
Area Service Highways	457.2	72.2		529.4
Collector Highways	226.7	1,356.1	66.4	1,649.2
Land Access Roads	2.4	1,373.8	6,398.2	7,774.4
Subtotal	1,250.6	2,827.5	6,464.6	10,542.7
Urban				
Interstate Highways	187.4			187.4
Class I Major Highways	330.4			330.4
Class II Major Highways	303.6	3.3	2.6	309.5
Area Service Highways	439.7	43.8	6.5	490.0
Collector Highways	278.8	1,427.7	178.3	1,884.8
Primary Thoroughfares	25.7	260.6	1,109.0	1,395.3
Secondary Thoroughfares	5.1	611.1	1,313.9	1,930.1
Commercial Streets		9.0	501.6	510.6
Residential Streets	1.4	1,559.8	23,081.0	24,642.2
Subtotal	1,572.1	3,915.3	26,192.9	31,680.3
TOTAL	3,674.2	6,742.8	32,657.5	43,074.5

[1]Included in the total of Toll Highways is the mileage of those facilities which are designated Interstate.

HIGHWAY NEEDS

Sound improvement programming and fiscal planning must be based on a determination of financial requirements for construction, maintenance, and administration of the highway transportation system for some predetermined time period. The purpose of this study is to determine physical improvements needed in the next 20 years and to develop recommended fiscal programs which will permit the improvement of the highway transportation system to acceptable standards.

The study includes an evaluation of needs for all highways, roads, and streets in New Jersey under state, county, and municipal jurisdiction, a total of over 32,000 miles. The estimate covers the period from January 1, 1967, through December 31, 1986. The total needs estimate is the sum of the expenditures which normally can be expected to occur in the construction, maintenance, and administration of the several highway systems. Total program costs for intermediate periods are also developed so that future planning can be accomplished on the basis of the program period which is commensurate with the state's fiscal policies.

Although deficiencies exist on all systems, the major portion of deficient mileage can be identified in one or two major categories. A very small portion of total deficient miles are identified as having critical surface conditions. This reflects a commendable highway policy

EXISTING DEFICIENCIES BY PRESENT ADMINISTRATIVE SYSTEMS

State System

1. Critical surface condition on 11.4 miles;
2. Inadequate surface width on 603.3 miles;
3. Deficient surface width and condition on 0.8 miles; and
4. Other deficiencies on 40.4 miles.

● **Total deficiencies in some respect on 655.9 miles, or 35.3 per cent, of the state system, exclusive of the Interstate System.**

County Primary System

1. Critical surface condition on 93.3 miles;
2. Inadequate surface width on 380.6 miles;
3. Deficient surface width and condition on 24.0 miles; and
4. Other deficiencies on 292.8 miles.

● **A total of 790.7 miles, or 11.7 per cent, of the county primary system deficient in some respect.**

Municipal Primary System

1. Critical surface conditions on 73.3 miles;
2. Inadequate surface width on 60.8 miles; and
3. Other deficiencies on 23.2 miles.

● **A total of 157.3 miles, or 9.3 per cent, of the municipal primary system deficient in some respect.**

which insists on high design standards for pavements and an effective maintenance program. However, substantial mileages were found deficient in surface width or shoulder width. A total of 603 miles (32.5 per cent) of the state highway system was found deficient in surface width. This deficiency accounted for all but 2.8 per cent of the 656 miles of deficient mileage on the present state system. Primary county and primary municipal systems had mileages deficient in surface width, surface condition, or shoulder width amounting to 11.7 per cent and 9.3 per cent, respectively, of the total mileage in these categories.

Identified construction needs include the improvement costs of presently deficient highways, roads, and streets and also the costs of improving those facilities which can be predicted to become deficient within the 20-year study period. Also included are construction costs of new facilities which will be required to meet future travel demands. Identified construction needs were developed by estimating the cost of improving deficient facilities or construction of new facilities to design standards for traffic volumes 20 years from the time of improvement or construction. These needs have been determined by an individual appraisal of all highways except land access roads and residential streets. Needs on these facilities were estimated on an average annual basis by a mass analysis procedure.

- Needs are summarized in 10-, 15-, and 20-year programs. To measure the magnitude of the programs, they are shown on an average annual cost basis. Unit costs used in the appraisal are based on 1966 price levels. Total costs are for the recommended functionally classified systems.

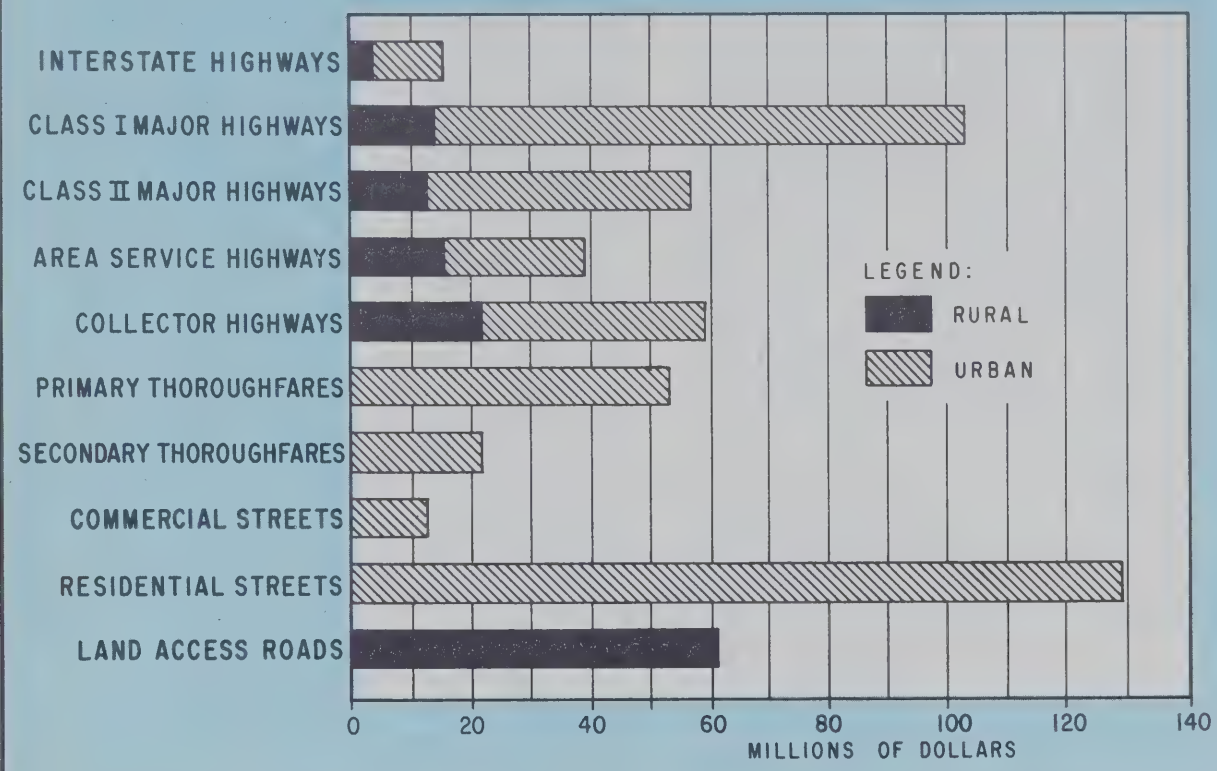
- The recommended Class I Major Highway system of 338.3 miles will cost $1,718,454,000 with more than two thirds of the total system scheduled for the first 10 years of the program period. This system represents the most critical highway transportation need of the state. The future mobility and flexibility of the highway transportation system will be adversely affected if the construction of these facilities are unduly delayed.

- According to the 1967 cost estimates prepared by the New Jersey Department of Transportation, initial completion of the Interstate System will cost $814,717,000 of which the

IDENTIFIED CONSTRUCTION NEEDS

FUNCTIONAL CLASS[1]	*BACKLOG*	*1967 1971*	*1972 1976*	*1977 1979*	*1982 1986*	*TOTAL*
			(millions)			
Class I Major	$ 561	$392	$287	$296	$182	$1,718
Class II Major	498	39	124	89	63	813
Area Service	219	29	84	48	77	457
Collector	338	33	74	49	51	545
Primary Thoroughfare	33	12	14	425	343	827
Secondary Thoroughfare	60	16	38	4	18	136
TOTAL	**$1,709**	**$521**	**$621**	**$911**	**$734**	**$4,496**

[1]Does not include costs of Interstate System or land access roads and residential and commercial streets.



AVERAGE ANNUAL 20-YEAR NEEDS BY FUNCTIONAL CLASSIFICATION

NEW JERSEY

1967-1986

Wilbur Smith and Associates

AVERAGE ANNUAL COST BY RECOMMENDED ADMINISTRATIVE SYSTEMS

PROGRAM PERIOD	*STATE*	*COUNTY* (millions)	*MUNICIPAL*
10-Year	$296	$75	$238
15-Year	245	64	265
20-Year	215	59	277

federal government will bear 90 per cent. Other Interstate System costs which must be borne by the state are future replacement construction and maintenance and administration. These costs have been estimated at $224,765,000 during the program period of 20 years.

- Annual needs for construction, maintenance, and administration of the recommended state system add to an impressive total of $214,505,800, including the 10 per cent state matching funds for the Interstate System. Basic to this estimate is the assumption that all existing deficiencies will be eliminated and that future needs caused by anticipated traffic growth and normal obsolescence will be met during the 20-year program period. If the program is shortened to 15 years, average annual costs will rise to $244,878,900; similarly compressing the program to 10 years will require $295,977,600 annually. The program periods refer to the time required to eliminate the backlog needs and improve the system to acceptable standards. For the shorter program periods, costs of normal replacements and maintenance will be incurred during the remainder of the 20 years.

- Needs of the recommended county system will average $59,182,400. Average annual costs of the 15-year program will total $63,894,900 and for the 10-year program, $74,565,400.

- The municipal system needs will vary from $237,882,500 annually for the 10-year program to $276,844,700 for the 20-year program. The needs of the municipal system are the reverse of the normal expectations of decreasing annual costs for the longer program periods. This is the direct result of the need for greatly expanded urban faclities in the latter part of the program, particularly for primary thoroughfares and residential streets. Present primary thoroughfares were utilized by assuming that traffic engineering devices such as no parking, one-way couplets, etc. would be applied to traffic conditions until such time as capacity on these facilities become intolerable. Costs of constructing substantial mileages of new residential streets were expected to be borne by developers, with maintenance and reconstruction by the local units. Costs under these two assumptions would become significant later in the program period.

HIGHWAY REVENUES

Financing of state governmental functions in New Jersey is through general fund appropriations, in that proceeds derived from state tax levies are deposited in the general fund and appropriated to the various governmental functions by the Legislature. Therefore, a comparison of highway-user tax revenues in relation to highway needs is academic but certainly not precluded. The highway transportation system is financed by general fund appropriations, federal-aid funds, and revenues from local tax sources of counties and municipalities.

In 1966, net revenues derived from state collected highway-user tax revenues totaled

EXISTING HIGHWAY-USER TAX REVENUES, LOCAL REVENUES, AND FEDERAL AID

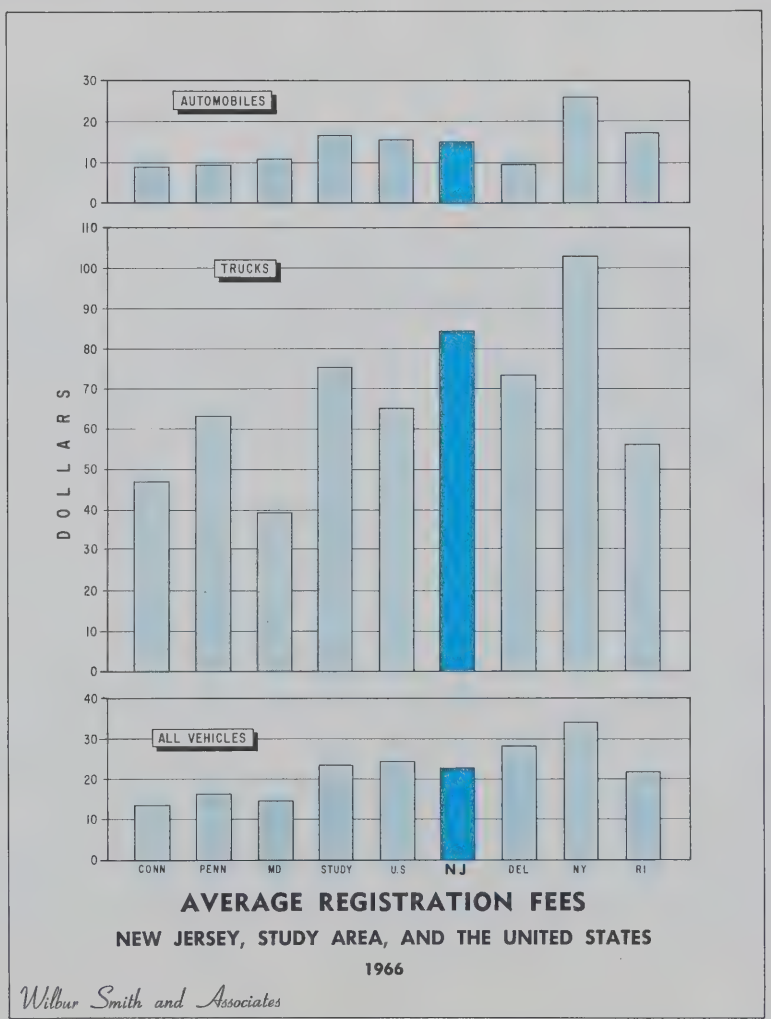
1966

Motor Fuel Tax	$144,655,033
Motor Vehicle Registrations	78,037,003
County Local Revenues	27,997,000
Municipal Local Revenues	89,086,000
Federal Aid for Highways	91,569,548
TOTAL	$431,344,584

$222,692,036; locally raised revenues, $117,083,000; and federal aid, $91,569,548. State appropriations for highway purposes totaled $108,650,000, including the state police in 1966. *Total state appropriations were less than half of the 1966 net highway-user tax revenues.* In the judgment of the legislature there are other governmental functions which have a higher priority on rather scarce economic resources than highways. *Nevertheless, it should be emphasized that the highway user has been, is, and will be paying substantially more user taxes than the present and anticipated level of general fund appropriations for highways.*

Motor Vehicle Registration

Motor vehicle registrations in New Jersey totaled 3,122,876 in 1966, up 30.1 per cent since 1960. Passenger cars increased 31.4 per cent to a total of 2,789,497; and trucks, 20.3 per cent to 325,054 in the same period. *Total registrations are expected to reach 5,280,000 by 1986, an increase of almost 69 per cent over 1966.* Passenger car registration fees are based on the manufacturers' shipping weight and vary from $10.00 to $25.00. The average fee paid for passenger cars in 1966 was $15.47. The average fee for trucks in 1966 was $84.55. The



AVERAGE REGISTRATION FEES
NEW JERSEY, STUDY AREA, AND THE UNITED STATES
1966

Wilbur Smith and Associates

average fee for all vehicles was $22.79. Gross revenues derived from registration and related fees totaled $83,300,485 in 1966. Net revenues after deducting administrative expenses were $78,037,003. *Net motor vehicle registration and related fees are expected to increase to $133,084,000 by 1986, up 70.5 per cent.*

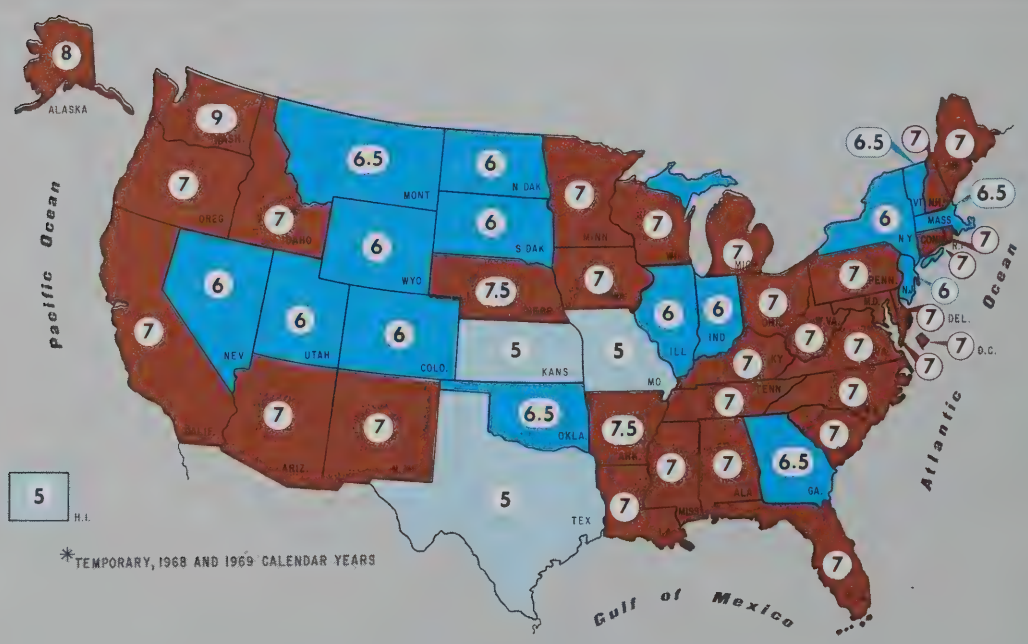
Motor Fuel Tax Revenue

New Jersey's motor fuel tax rate is below the weighted national average of 6.43 cents. It is significant that this situation has held since 1927, the first year a motor fuel tax was imposed in the state.

Revenue from the 6 cents per gallon tax on motor fuel is an important source of funds to the state. In 1966, net motor fuel taxes, after deduction for nonhighway use totaled *$144,655,033. It is anticipated that by 1986 net motor fuel tax revenues will total $267,178,000, an increase of almost 85 per cent.*

Local Revenues

Locally-raised revenues for road and street purposes have risen steadily in recent years and are estimated to total $117,083,000 in 1966. Local revenue sources are obtained almost entirely from general fund appropriations.



STATE GASOLINE TAX RATES
JANUARY 1, 1968

Wilbur Smith and Associates

It is estimated that 1986 revenues from local tax sources for roads and streets will total $219,739,000.

Total Revenues

Total revenues for New Jersey's highway transportation system include general fund appropriations, both state and local, property and special assessment taxes, and federal aid. As there is no reliable basis for projecting general fund appropriations for highway purposes at the state level because of the erratic historical trend, these funds have been included in total revenue estimates at the 1966 level. Federal aid, despite the uncertainty of the size, shape, and emphasis of the future federal program, has been estimated at about $108,000,000 annually after 1973.

In 1966, revenues from all sources for highway purposes totaled $313,152,450, including Interstate System appropriations. Of this total, $104,500,000 represented the state general fund appropriation. By 1986, assuming state appropriations remain at the 1966 level, total revenue available would be $432,239,000, an increase of only 38 per cent. An increase of this size would be so inadequate that the highway transportation system of the state would become intolerable within a very few years.

Total net revenues derived from highway-user taxes and local tax sources plus federal aid totaled $427,373,856 in 1966. *By 1986, such revenues are estimated at $728,001,000 and are expected to average $595,195,200 over the 20-year period, an amount sufficient to finance the total highway needs program.*

COST ALLOCATION

Inasmuch as New Jersey is a general fund state, the application of findings of highway cost allocation analyses would seem to be of little moment. There are, however, certain basic conclusions which can be drawn from such analyses which will be of value in determining future tax policies of the state, insofar as motor vehicles and motor fuels are concerned. The anticipated highway-user tax payments can be compared with estimated needs and an evaluation of the present tax structure can be accomplished based on the findings of the cost allocation analyses.

Because governments are competing with private transportation media in providing highway transportation services to the public, it is highly desirable that investments of economic resources in the highway plant should represent the best investment of such resources based on the economic benefits to be realized. Highway-user charges should be related to costs incurred regardless of the fact that in New Jersey there are no dedicated revenues for highway purposes. If it can be demonstrated that the present level of highway-user taxes are adequate to meet the user share of costs of needed improvements, substantial increases in user taxes would not seem to be in order. By the same token, it is reasonable to suggest that if the present tax structure does not adequately provide for the user's share, some adjustments would seem in order.

Although the results of cost allocation analyses are usually quite reliable, they should be considered only as indicators in determining tax policies and not as precise answers.

Cost Responsibilities of Highway Users and Nonusers

The allocation of total costs between highway users and nonusers resulted in cost assignments of $427,471,900 (72.8 per cent) to the user and $159,723,300 (27.2 per cent) to the nonuser. Deducting federal aid from the total user share left the state user share of program costs at 70.0 per cent. Comparison of this assignment with 1966 state highway-user tax revenues and local funds shows the following:

REVENUE	*AMOUNT*	*PER CENT*
Net State Highway-User Tax Revenues	$222,692,036	65.6
Local Revenue (nonuser)	117,083,000	34.4
TOTAL	$339,775,036	100.0

Although revenues are not the criteria on which cost allocations are based, the 1966 data show that at the present level of taxation, state highway user contributions are somewhat less than the cost assignment of 70.0 per cent although not significantly so. However, if average annual state highway-user tax revenues, as estimated for the 20-year program period, are compared with cost assignments, the highway-user contribution falls considerably short of assigned program costs. This, of course, is assuming that net state highway-user tax revenues were dedicated to highway purposes.

Cost Responsibilities of Classes of Vehicles

The differential cost analysis approach was used to allocate the highway-user share of the 20-year program. Of the several approaches to determining the highway-user cost responsibility, the incremental method provides the best theoretical basis for making these determinations, although for comparative purposes, other methods were included. The basic concept of the incremental approach is that certain highway expenditures can be separated into increments of cost incurred in accommodating specific vehicles. Additional expenditures required by larger and heavier vehicles are assessed only against those vehicles which require such additional expenditures.

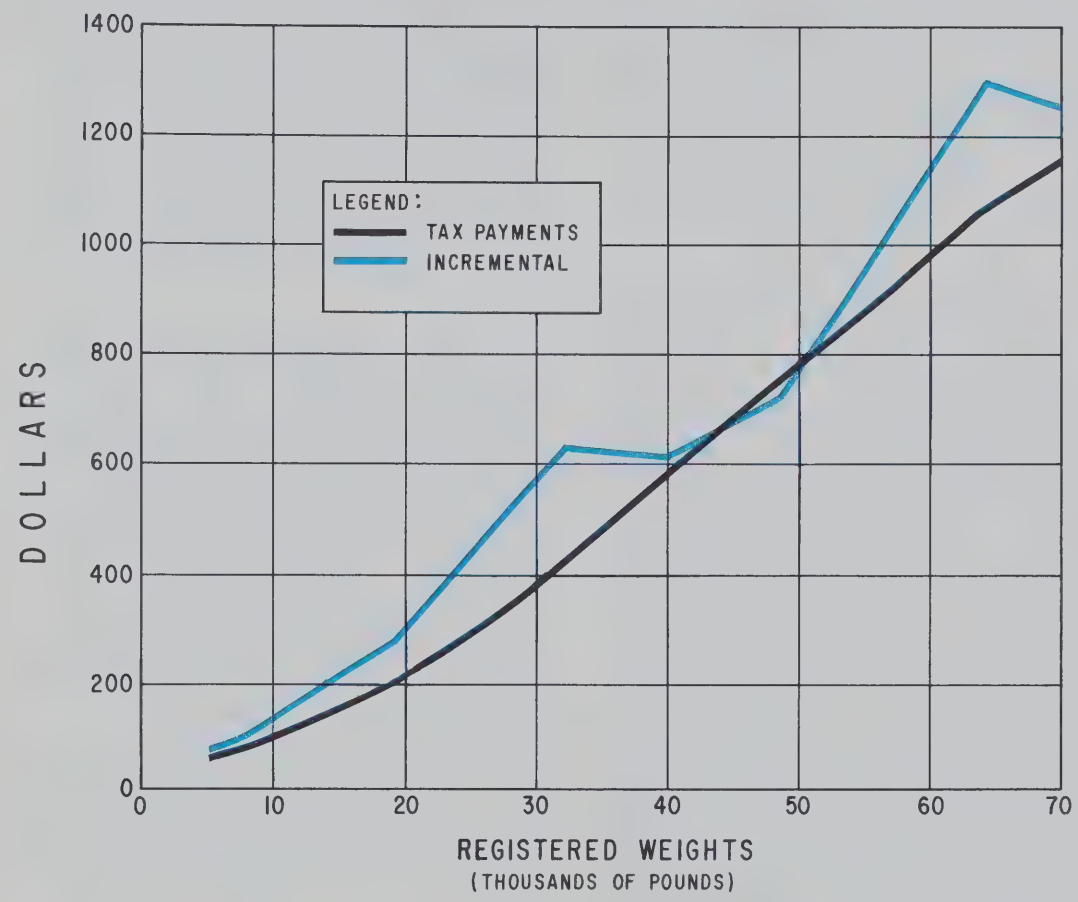
The cost responsibility of each class of vehicles is compared to anticipated tax payments to determine the excess or deficit of such payments.

The average annual highway-user share of the 20-year program as determined by the user-nonuser cost allocation analysis was $427,471,900. Deducted from this total was the anticipated annual apportionment of federal funds of $55,429,300. The remainder, $372,042,600, represents the amount of state highway-user taxes which equitably should be collected from motor vehicles for their use of New Jersey's highways. Anticipated payments represent the amounts paid by highway users in the form of state highway user taxes under existing tax rates.

The annual cost assigned to passenger cars was $66, or $10 greater than their anticipated tax payments. Anticipated bus payments of $501 fall far short of their assigned costs, $1,228.

All trucks, except for those having a gross weight of 44,000-52,000 pounds are contributing less than their assigned cost responsibility, varying from a deficit of $7 for the lightest truck (2,000-6,000 pounds gross weight) to $234 for the 60,000-68,000 pound class.

The results of the cost allocation analyses show that an upward adjustment in state-user taxes could probably be justified, assuming highway-user tax revenues were dedicated to highway purposes. **It is difficult to rationalize an indicated need for increased user contributions with the fact that annual appropriations for highways are less than half of the net highway-user tax revenues. Nevertheless, in considering financing of an accelerated program of highway construction, findings of the cost allocation analyses should be evaluated.**



COST RESPONSIBILITY VERSUS TAX PAYMENTS
(PER VEHICLE)
NEW JERSEY

Wilbur Smith and Associates

CONCLUSIONS AND RECOMMENDATIONS

New Jersey's transportation systems are not presently capable of meeting the travel demands placed upon them. The state's growing economy and population will place even further demands on now inadequate facilities. The growth of suburban areas envisioned over the next 20 years, with the attendant pressures for additional transportation facilities, will call for a concerted effort on the part of all governments involved if these needs are to be met. Similar to other highly urbanized and industrially-oriented states, all transportation modes in New Jersey will play an important part in the state's future; the major role being played by the highway transportation system.

Financing the Program

New Jersey's demonstrated need for channeling additional funds into the highway program places the burden of determining the magnitude of future programs at a policy and legislative level. As a practical matter, the magnitude of the program will be one of compromise. **It can be categorically stated, however, because the future economic growth of New Jersey is so intimately keyed to an adequate transportation system of which highways are the most vital mode, that positive and accelerated action should not be delayed.**

State Highway Programs — The present inadequacy of the highway transportation system can be traced directly to years of inadequate fiscal resources. For many years, the construction program consisted of only matching federal-aid highway funds. This has been far from sufficient to meet the very apparent need for an emphatic and positive program.

As funds for state functions are apportioned by the Legislature and by statute cannot exceed anticipated revenue, there is little reason to believe that a proposed accelerated highway construction program can be effectively translated into a reality by relying on annual appropriations. Therefore, it would appear that the most practical method of accelerating the construction program would be through the use of bond proceeds.

There are numerous approaches to financing the program through the use of credit. One approach would be to finance only those projects having highest priority as a short-range program. Another would be to consider a very substantial bond issue adequate to finance a 10-year accelerated program. The third, and the one that would lend itself to sound and progressive long-range planning, would be to finance a 15-year program that would satisfy the capital requirements of the state highway system.

A bond issue program of this magnitude coupled with appropriations adequate for maintenance, administration, debt service, and increased state-aid would make available the financial tools for a truly accelerated program. The proposed fiscal plan would result in a state highway construction program increasing from the 1967 level of $151,700,000 to $276,300,000 in 1974. State funds needed to finance the accelerated program aggregate $1,808,900,000 for the 15 years with federal funds of $1,770,100,000, resulting in a total construction program of $3,579,000,000. Appropriations necessary to finance the proposed construction program would peak at $124,000,000 in 1982. Total appropriations including amounts for maintenance, administration, state police, and state aid would aggregate $250,600,000 in 1984.

As the proposed program calls for a substantial increase in general fund appropriations, it is believed that a portion of the general fund revenues should be replaced. **Findings of the cost allocation analyses and need to supplement general fund revenues indicate an upward adjustment in the highway-user tax rates. It is highly possible that the highway user, if assured of a progressive, long-range construction pro-**

gram, might regard such tax adjustment as reasonable.

The use of credit to finance the accelerated program has several cogent arguments which would tend to favor such a step at this time.

1. **The large-scale use of bond issues to accelerate the capital program for highways is the only logical move that will assure adequate funding of the program.**
2. **It will enable the Department of Transportation to prepare a long-range program with accomplishment of desired goals more definitive than in the past.**
3. **The bond issues, guaranteed by the full faith and credit of the state, should be well received in investment circles ensuring a relatively favorable rate of interest.**
4. **Most importantly, the cost of constructing highway facilities is consistently increasing. From 1960 to 1966, the Bureau of Public Roads' construction price index (on a 1957-59 base) rose 20 per cent, or about 3 per cent per year compounded. In other words, the 1966 construction dollar is worth only 83 cents relative to the 1960 construction dollar. There do not appear to be, in our expanding economy, any developments that would tend to dampen this consistent upward trend in prices. If this trend does continue, a minimum 20 per cent increase can be expected in the next decade. Therefore, the use of borrowed funds that are to be repaid with depreciated future dollars represents an excellent investment.**
5. **One of the circumstances under which it is prudent for governments to incur debt is for capital investment in relatively long-lived facilities. Another circumstance under which governments should consider credit financing is the construction of public works which are socially and economically advantageous and productive.**

County Highway Program — The average annual requirements for funds to bring the county highway system up to acceptable standards in 20 years exceeds estimated funds from present sources by almost $7,000,000 annually. Although the annual deficit is significant, it is not without solution. A reasonable increase in state aid to county highways, coupled with an equal increase from local revenue sources, will produce a practical answer to financing the county program.

Municipal Road and Street Program — Modernization of the municipal system is confronted with a recurring annual deficit of critical magnitude — averaging $141,500,000 annually during the 20 years. Two alternatives are available to meet the annual deficits, neither of which are easy solutions. First, the combined funds from state aid and local revenues can be increased to offset the deficit. Second, credit financing may be used through the device of long-term obligation state bonds to provide state-aid funds equal to the adjusted deficit, after optimum local revenue sources have been applied.

Because of the anticipated growth of urbanization in the state, it is believed that more emphasis on urban programs is indicated. Also, it is almost a certainty that future federal-aid highway programs will be strongly oriented toward solutions of urban transportation problems. However, until such time as a definite program of this type is developed, a priority program to select facilities most in need of improvement in the early years is mandatory. Such a program would be predicated on the principle of improving those facilities first which will return the greatest benefit to the public.

Federal-Aid Apportionments

The course of future federal-aid programs is, at the present time, very uncertain. The American Association of State Highway Officials submitted a report to Congress late in 1967 with

their proposals for the size, scope, and direction of the post-Interstate program.

Most recently, the U. S. Department of Transportation submitted its report, *1968 National Highway Needs Report.*[1] Contained in the report, although couched in rather broad terms, is the Department's outline of federal-aid policy of the future. This policy is as follows:

1. Continuing assistance to the states for improving the efficiency and safety of the highway system in both rural and urban areas, particularly where traffic growth is expected. Studies will be necessary to redefine the federal-aid systems and enable sound economic analyses to reveal how and where the investment of federal funds would be most beneficial in terms of national objectives, general economic and social benefits, and transportation service to people and commerce.
2. Greater stress than in the past to the improvement of urban transportation and the development of transportation plans calculated to raise the quality and satisfactions of urban life.
3. Additional emphasis on the coordination of highways with other modes of transport, both intra and interurban to ensure the optimum provision of the best features of all modes.
4. Continuing emphasis on making the highway a salutary influence on the environment both in rural and urban areas.

It will be noted that the problem of urban transportation and the coordination of highways with other modes of transport are specifically noted in this statement of desirable federal highway policy.

New Jersey, however, cannot await the completion of the Interstate System in planning for future highways. The Department of Transportation will need every year of lead time between now and 1975 to effect the orderly transition to the new program.

A reasonable analysis of the direction of future federal aid for highways would indicate that New Jersey's share of the program will be in excess of the present level, including Interstate funds. This observation is based on the apparent emphasis placed on urban transportation problems.

It is strongly suggested that the long-range planning for the highway transportation system of the state be conducted with the thought that the federal government will take positive action in the near future and that increased apportionments for the state will be realized.

[1] *1968 National Highway Needs Report,* Committee Print, 90th Congress, 2nd Session, U. S. Government Printing Office, Washington, D. C., 1968, p. 7.

SUMMARY OF RECOMMENDATIONS

The recommended actions which are believed necessary to modernize the highway transportation system of New Jersey in order to keep pace with the expanding economy, increased population, and the accompanying future traffic demands are:

- **Adopt the 15-year construction program for state highways.**
- **Accelerate the state highway program by the use of credit financing.**
- **Increase the motor fuel tax rate to 7 cents per gallon.**
- **Establish the annual appropriations of the legislature at a level commensurate with the annual debt service payments, highway maintenance and administration costs, state police, and an accelerated state-aid program for local units.**
- **Adopt the recommended functionally classified highway systems.**
- **Provide for establishing a functional classification review board.**
- **Provide for the purchase of rights-of-way as far in advance as is determined feasible.**
- **Adopt a 20-year program for the counties and municipalities, with substantial increases in state-aid funds.**
- **Initiate, as soon as possible, a comprehensive and cooperative traffic improvements program for arterial streets in urban areas.**

Other Considerations

Although not included in the scope of this study, three other items should be given very serious consideration by the Department of Transportation.

Continuing Study Processes — While the present study provides the basis for recommendations concerning highway programs for the future, these programs are subject to revision due to unanticipated and unforeseen developments. Therefore, a system for continually updating the present study should be adopted.

Priority Improvement Program — Although this study has shown that highway agencies will be unable to meet all needs under present financial policies and programs, this does not obviate the expenditure of available resources on projects which will provide the greatest benefits. Therefore, priority construction programs should be developed by each highway agency using data developed in this study to ensure selection of improvement projects on the basis of factual need.

Parking in Urban Areas — The most efficient usage of capital investments demands elimination of parking from urban arterial facilities in order to increase traffic capacity. Consideration should be given to a joint effort by state and local governments to develop self-supporting off-street parking facilities.

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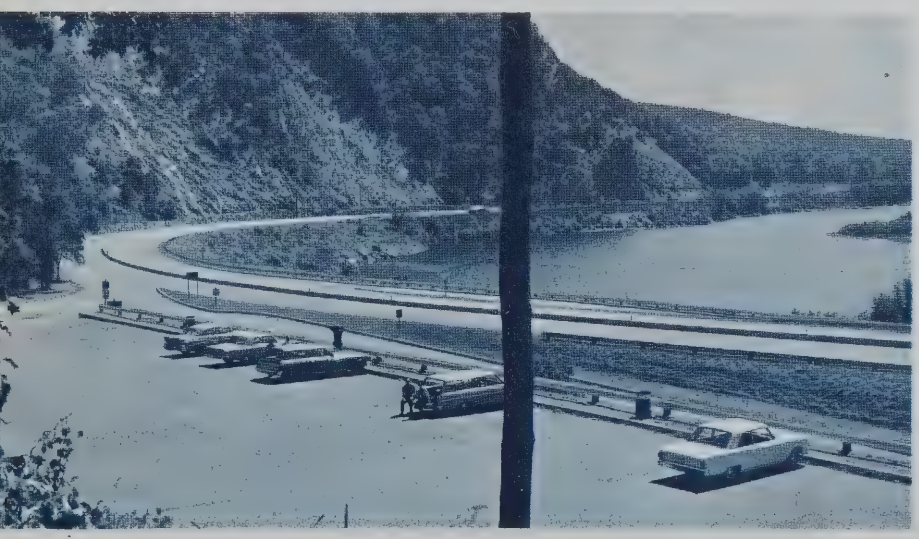
INTRODUCTION

Chapter 1

New Jersey, in recent years, has experienced a growth in all major facets of its economy which has added greatly to a previously complex problem of providing a comprehensive and efficient transportation system. New Jersey's position as a "corridor" state, and its place in the center of the rapidly expanding Megalopolis of the Northeast, only serve to magnify the complexity of this problem.

The keystone of New Jersey's total transportation system is its network of highways, roads, and streets. Interacting with the facilities of other modes, it provides the foundation for meeting the travel requirements of today and of the future. Although many recommendations have been advanced for radical changes in basic transportation methods and hardware, and substantial research is in progress, no combinations of recommendations and research results serve to reduce the requirements for a modern, safe and efficient network of highways, roads, and streets. Instead, the systems of road and street facilities, rather than being in competition with mass transit modes, are complemented by them.



With the standard of living rising in America, people are finding more time and opportunity for enjoying themselves. A major portion of all recreational activity is associated with use of highway facilities. Scenic routes with public rest areas are contributing much to the success of the citizens of New Jersey in their "pursuit of happiness."

The New Jersey Department of Transportation recognized the need for a thorough examination of the role of all highways, roads, and streets in the complete transportation system. In March, 1966, it authorized the Comprehensive Highway Needs and Fiscal Study to provide a realistic appraisal of the requirements for improving and maintaining the statewide network of highways and streets, adequate to meet travel demands for the next 20 years.

This study has provided the information and engineering data required to determine the type of highway systems needed, the cost of various improvement programs, and the most equitable means of financing highway needs. Included are studies of the economy, other modes of transportation, highway classification, highway needs, allocation of highway cost and fiscal requirements to meet the determined highway needs. Each highway and street system has been studied and planned to make its proper contribution as determined by growing needs and relative service requirements.

Scope of Study

Seven major areas have been investigated and analyzed in connection with the New Jersey Comprehensive Highway Needs and Fiscal Study: (1) Transportation Economy, (2) Other Modes of Transportation, (3) Highway Classification, (4) Highway Needs, (5) Allocation of Highway Costs, and (6) Highway Finance. Determinations have been made of the requirements for highway, road, and street improvements from January 1, 1967, to December 31, 1986.

Consideration has been given to a review of problems relating to the planning of urban highways, with particular regard to the division of responsibility for necessary services among state and local governmental units. The selection of adequate freeway corridors has been performed. An analysis of the federal-aid system classification and its relationship to the overall classification of all highways, roads, and streets as well as apportionments of federal funds to state and local units and the position of highways in the total transportation framework have been accomplished.

Transportation Economy — All major sectors of the economy of the State of New Jersey have been analyzed. Broad trends have been identified and changes in the location of economic activity have been studied. Population growth and changing factors in the nature and forces underlying population growth in urban and rural areas have been analyzed; this was accomplished by economic region, by county, and by metropolitan area. Estimates have been made of population and employment to the year 1986. Estimates have also been made for the probable labor force available in New Jersey in 1986.

Demographic techniques have been developed for the projection of population by units as small as counties. In addition, techniques were developed for relating estimated population increase as a ratio of labor force. Analyses were made of the age structure of the population in New Jersey, as well as the patterns of migration.

Other Transportation Modes — In order to place the requirements for improvements to the highway and street systems in perspective, investigations were made into the magnitude and character of service provided by other modes of transportation in New Jersey. The knowledge gained from these investigations permitted the analyses conducted in the functional classification phase of the study to consider the role of highways and streets in the total transportation network. In addition to determining the salient features of each mode, consideration was given to all firm plans for changes in the structure of each mode.

Highway Classification — With passage of time, population changes, industrial development and construction of new facilities, the service characteristics of highways and streets tend to change. To assure the most efficient programming and use of funds for highway improvements, highways should be categorized in systems and constructed or improved in accordance with standards of design which are commensurate with the anticipated traffic volumes and usage.

A major objective of this study is the reclassification of all highways and streets in New

The work undertaken in the current study includes a comprehensive analysis of the highway, road, and street systems of the state and the financial resources on which they are dependent. As a part of the basic needs and fiscal study, other analyses were conducted concerning transportation economy, other transportation modes, highway classification, and cost responsibility.

Jersey in accordance with anticipated use and traffic volumes estimated for 1986. Methods and procedures have been developed for a program of continuing reclassification.

Highway Needs — In recent years, cost per mile for highway improvements to meet the pressures of growing motor vehicle registrations and travel have increased greatly, particularly in urban areas. It is imperative, therefore, that new facilities be constructed in accordance with needs based on long-range planning. A principal phase of this study is the determination of 20-year needs for all highways, roads, and streets in New Jersey.

To accomplish this objective, a complete inventory was made of all arterial and collector mileage to define present conditions. Analyses were conducted to determine requirements for construction or reconstruction necessary to improve these facilities to accommodate estimated traffic at the end of the 20-year improvement period. In addition, by statistical sampling methods, a mass analysis was performed of improvement needs on all remaining mileage. Costs for accomplishing the indicated construction, categorized in time periods, and for operating and maintaining the upgraded highway, road, and street facilities, have been determined by administrative systems. These costs are compared with anticipated revenues to evaluate deficits or surpluses for each system within several possible improvement periods.

Fiscal — Historical legislative appropriations to the New Jersey State Highway Department have been studied. Past trends in the collection of highway revenues at the state, county, and municipal levels were analyzed. This covered both highway-user revenues, such as motor fuel taxes and registration fees; and nonhighway-user taxes such as property taxes and other general fund revenues.

After defining the sources, amount, and distribution of current funds for state, counties, and municipalities, the funds for each of these jurisdictions were projected. Projections were made for three possible improvement programs covering the 20-year study period. Average annual receipts for the three improvement pro-

grams, 10, 15, and 20 years, were computed by 5-year increments. Comparisons of receipts and needs for each of the program periods were made to determine deficits or surpluses of funds for each period.

From the magnitude of surpluses or deficits for each period, a recommended program period was determined, judged by the estimated potential for obtaining the required funds. Changes in tax rates and utilization of revenues to discharge deficits in each governmental jurisidiction have been recommended.

Allocation of Costs and Distribution of Revenues — A basic requirement of a comprehensive highway needs and fiscal study is a determination of the allocation of highway and street improvement costs to all responsible parties. This is accomplished by first allocating total cost between highway users and other direct beneficiaries and nonusers or indirect beneficiaries. Highway-user costs are then allocated among classes of users.

The report includes a full discussion of the various allocation methods and explains the solutions in detail.

Recommendations — Recommendations of the study are centered on the ways and means of obtaining the additional funds which are needed to accomplish the several programs outlined in the study. The recommendations have been developed after carefully evaluating present tax rates as related to the internal tax structure of New Jersey. Also, the recommended solutions are based on the distribution of needs among highway administrations, taxing potentials of state and local governments and growth in future highway funds at all levels of government.

Sources of Study Data

The basic source of data used in the study was the New Jersey Department of Transportation, with the Division of Planning providing not only a major portion of the data, but invaluable guidance and assistance in obtaining additional data from other sources as well.

Significant contributions were made also by a number of organizations and agencies outside the Department of Transportation. The urban area transportation studies made substantial data and statistics available. These included the Tri-State Transportation Committee and the Delaware Valley Regional Planning Commission. Several departments within the New Jersey state government provided very meaningful additional information. These included the Departments of Conservation and Economic Development, Agriculture, Labor and Industry, Law and Public Safety, and the Treasury.

The toll road and bridge authorities, which supplied data and statistics on both inter- and intra- New Jersey travel by all transportation modes, included the following:

The New Jersey Turnpike Authority,
The New Jersey Highway Authority,
The New Jersey Expressway Authority,
The Port of New York Authority
The Delaware River Port Authority,
The Delaware River Joint Toll Bridge Commission and Delaware Bay and Bridge Commission.

Rutgers, the State University, and the Regional Plan Association also contributed significantly to satisfying the data requirements of the study.

Several federal agencies cooperated in furnishing important data. These included the Bureau of the Census, the Economic Research Services of the Department of Agriculture, the Office of Business Economics of the Department of Commerce, and the Department of Transportation.

New Jersey Transportation Acts

The State of New Jersey recently enacted two items of legislation which will have a very significant impact on the future transportation network in the state: the creation of the New Jersey Department of Transportation and the passage of the State Aid Road System Act of 1967.

The establishment of the New Jersey Department of Transportation, which became effective on December 16, 1966, portends an era of integrated planning and implementation

directed toward the development and maintenance of a balanced system of all transportation modes. At a time when the transportation problems in the state appear to be growing in geometric progression, the provision for the machinery to attack these problems, as contained in the Transportation Act of 1966, is a valid and solid indication that the state intends to meet its transportation needs with sound and aggressive solutions.

The State Aid Road System Act marks the beginning of a long sought solution to the problem of the proper classification and administration of highway and street facilities, according to their various levels of service and their respective contributory positions in the total transportation system. The Act makes possible the legal designation of routes eligible for state aid on the basis of the functional characteristics of those routes. In addition, it provides for the establishment of uniform design criteria to assist in the construction, reconstruction or betterment of roads and streets to standards sufficiently high to meet modern requirements for level of service demands and safety.

ECONOMIC ANALYSES AND PROJECTIONS

Chapter 2

The dependence of our expanding economy on adequate transportation is confirmed by the growth and use of transportation systems throughout the nation. The United States contains a third of the railroad mileage and a third of the surfaced road mileage of the world. In addition, ports, pipelines, and airways provide extensive commodity and passenger services. The volume of transportation in the United States is greatly in excess of the levels reached in any other nation.

Many new records have been established in highway transportation. Nationally, registrations have reached a new high of over 94 million vehicles in 1966, an increase of more than 25 million in 10 years. More than $14,000,000,000 in motor vehicle taxes was collected from motorists in 1966, a new record. Over $14,000,000,000 was expended on highways. Record disbursements of over $15,000,000,000 were estimated for 1967.

New Jersey's growing dependence on highway transportation and the extensive influence of automobile, truck, and bus services on all sectors of economic activity emphasize the importance of providing improved highways to serve the growing and changing economy. Over the decade of the 50's, motor vehicle registrations increased at twice the rate of population, 52.1 per cent as compared to 25.5 per cent. Between 1955 and 1966, motor vehicles registered in New Jersey increased from about 2 million to over 3.1 million. Motor vehicle-miles of travel in the state increased from 23.2 billion in 1955 to 34.5 billion in 1966.

As result of the increase in per capita income and the availability of installment credit with long maturities, a growing proportion of persons own and/or operate private automobiles. These trends are expected to continue as the economy grows.

Economy

New Jersey is the most highly urbanized and most densely populated state in the nation. This is related to its strategic location in the heavily populated and productive Atlantic Seaboard. Over two thirds of the state's population and economic activity is within the New York Consolidated Area, perhaps the largest metropolitan conurbation in the world.

Industry — New Jersey has long been one of the nation's leading industrial states. The foundation of this industrial prominence dates to the 19th century with the adoption of a liberal

New Jersey is the most highly urbanized and most densely populated state in the nation. An estimated 6.9 million persons in 1966 is expected to increase to about 10.0 million by 1986. Almost 90 per cent of the state's population resides in urban areas.

policy toward the formation and operation of large corporations. By the turn of the century, approximately half the nation's major corporations had been registered in the state.

New Jersey is primarily a manufacturing state with a high degree of product diversification. In 1963 the state ranked seventh in the nation in value added by manufactures. Further, the state leads the nation in the production of chemicals and allied products, and ranks high in the production of electrical machinery, instruments, food products, and apparel. The service and construction industries have grown at a rapid rate, and employ over 60 per cent of the total labor force.

Markets — New Jersey's strategic location in the urban economy of the Eastern Seaboard permits the channeling of commerce to a wide selection of major markets. A highly developed highway network has put 30 per cent of the national population within overnight trucking range of New Jersey's manufacturers.

Transportation — There are nearly 2,800 miles of rural and urban state highways and freeways, 19,300 miles of local rural roads, and 10,300 miles of local city streets which provide the network for vehicular traffic. The Garden State Parkway and New Jersey Turnpike provide facilities for modern high speed north-south motor vehicle movements. The Atlantic City Expressway provides for east-west transportation. Completion of the Interstate System will facilitate accessibility to many more parts of the state and to major markets, further enhanced by long-range plans for a supplemental network of high-standard highways.

Twenty-four railroads serve the state with a network of over 2,109 miles of track. Six of

these are passenger lines serving over 160,000 commuters daily. There are 79 airfields in the state. The most important commercial facility is Newark International Airport which handles nearly 5 million passengers annually, and current construction will double its capacity.

The great ports of New York and Philadelphia also serve New Jersey. Nearly half the export-import trade of the nation flows through the Port of New York while the Camden-Philadelphia port is the largest fresh water port in the world.

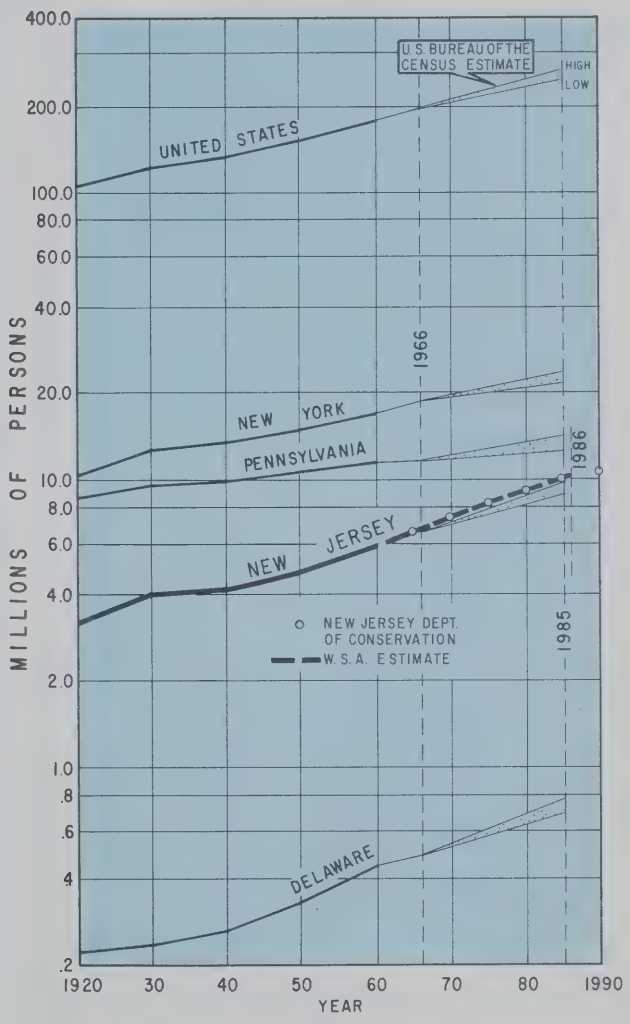
As an integral part of the industrial and commercial structure of the Eastern Seaboard and the nation, it follows that the development of the state is largely dependent on the transportation systems. Therefore, provisions should be made for the continued modernization and construction of efficient, economical, and convenient systems for the movement of persons and goods.

Population

Stimulated by economic growth and increasing employment opportunities, the state's population has grown rapidly. Natural increase supported by heavy net in-migration in the New York Consolidated Area and the other metropolitan areas, contributed to the increasing urbanization of New Jersey during the decade of the 1950's.

The population of New Jersey increased from 4.8 million in 1950 to 6.1 million in 1960, to an estimated 6.9 million in 1966 and is expected to increase to about 10.0 million by 1986. Between 1950 and 1960, the increase was 25.5 per cent, 2.3 per cent per year, compounded. Between 1960 and 1966, the estimated increase was 13.7 per cent, 2.2 per cent per year. Between 1966 and 1986, the forecast increase will be 44.6 per cent, 1.9 per cent per year. The population forecast for New Jersey in 1986 is slightly higher than the upper range projected by the Bureau of the Census and slightly less than the interpolated estimates of the New Jersey Department of Conservation. The actual and projected population trends for New Jersey from 1920 to 1986, and for the adjoining states and the United States to 1985, are depicted in Figure 1.

Table 1 shows the population by county in 1960 and the estimated population by county for 1986. The anticipated changes in the individual counties range from a loss of 5.9 per cent in Hudson County to a gain of 200.3 per



POPULATION TRENDS
NEW JERSEY, ADJOINING STATES AND THE UNITED STATES
1920-1986

Wilbur Smith and Associates FIGURE 1

TABLE 1

POPULATION

New Jersey Counties

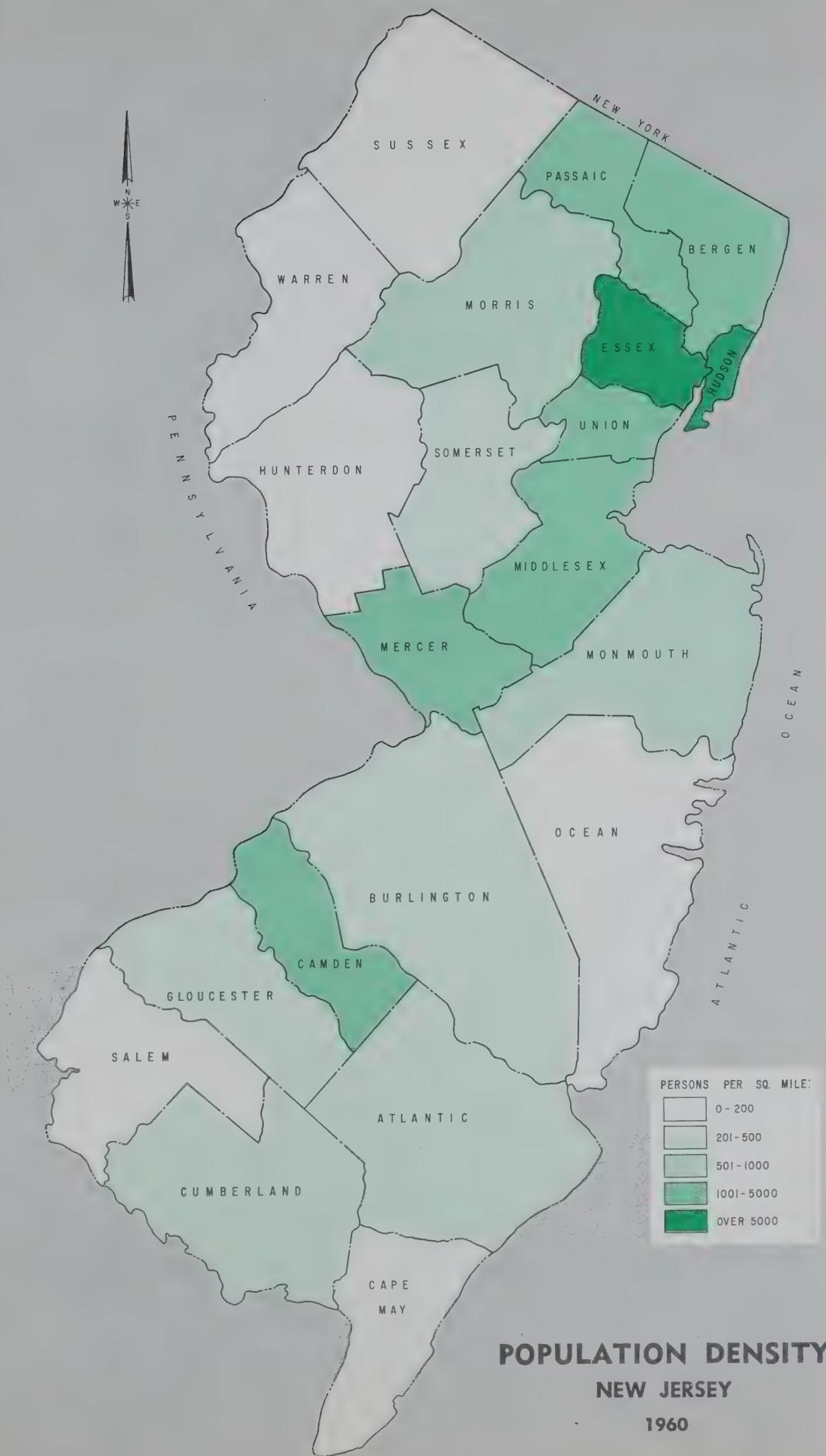
1960-1986

COUNTY	POPULATION 1960[1]	POPULATION 1986[2]	PER CENT CHANGE
Atlantic	160,880	240,000	49.2
Bergen	780,255	1,200,000	53.8
Burlington	224,499	460,000	104.9
Camden	392,035	620,000	58.1
Cape May	48,555	75,000	54.5
Cumberland	106,850	170,000	59.1
Essex	923,545	1,000,000	8.3
Gloucester	134,840	300,000	122.5
Hudson	610,734	575,000	— 5.9
Hunterdon	54,107	110,000	103.3
Mercer	266,392	380,000	67.9
Middlesex	433,856	1,000,000	130.5
Monmouth	334,401	850,000	154.2
Morris	261,620	700,000	167.6
Ocean	108,241	325,000	200.3
Passaic	406,618	600,000	47.6
Salem	58,711	90,000	53.3
Somerset	143,913	350,000	143.2
Sussex	49,255	120,000	143.6
Union	504,255	700,000	38.8
Warren	63,220	110,000	74.0
TOTAL	6,066,782	9,975,000	64.4

[1]*1960 Census of Population, Volume I, Part 32, New Jersey,* U. S. Department of Commerce, Bureau of the Census.
[2]Wilbur Smith and Associates.

cent in Ocean County. Figures 2 and 3 show population densities by county in 1960 and estimated densities in 1986. The density for the state will grow from 806.6 per square mile in 1960 to an estimated 1,326.3 persons per square mile by 1986. No county is expected to have fewer than 200 persons per square mile in 1986.

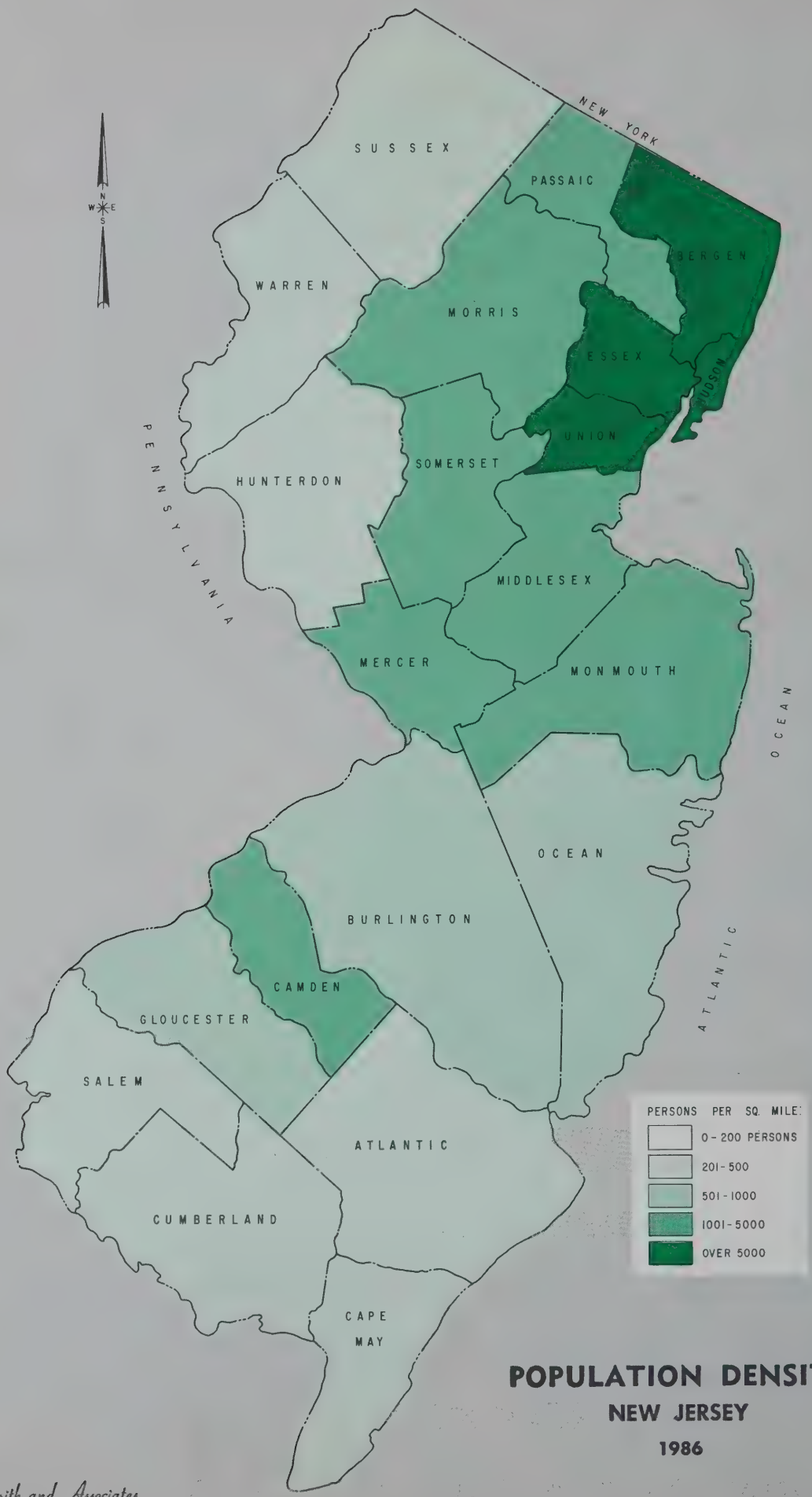
Urban-Rural Distribution — In 1960, 88.6 per cent of the people in the state lived in urban areas; only 11.4 per cent in rural areas. Figure 4 shows the growth in urban and rural populations since 1900. Since 1900, urban population has grown from 1.3 million to 5.4 million, from 70.6 per cent to 88.6 per cent of the total population of the state. Rural population grew from



POPULATION DENSITY
NEW JERSEY
1960

Wilbur Smith and Associates

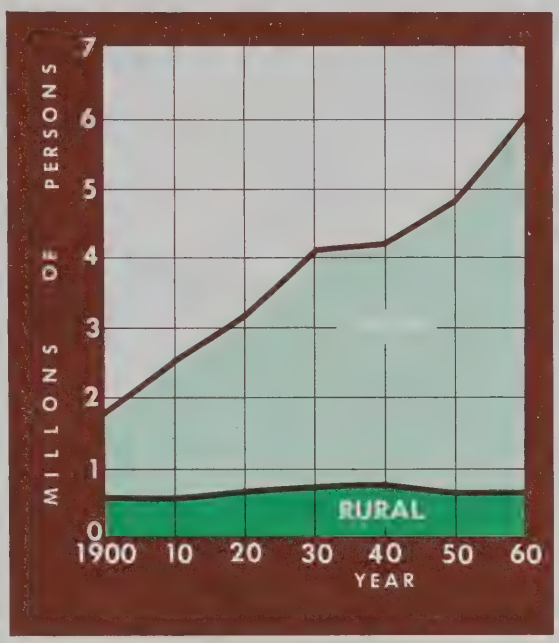
FIGURE 2



POPULATION DENSITY
NEW JERSEY
1986

Wilbur Smith and Associates

FIGURE 3



NEW JERSEY POPULATION

URBAN AND RURAL

1900-1960

Wilbur Smith and Associates FIGURE 4

555,000 to 692,000 but, as a proportion, declined from 29.4 per cent to 11.4 per cent of the population of the state.

Consolidated and Metropolitan Areas — In 1960, 88.4 per cent of the population resided in the New York-Northeastern New Jersey Standard Consolidated Area and in other standard metropolitan statistical areas (SMSA's) throughout the state.

Thirteen of New Jersey's 21 counties are included in SMSA's. These, together with the New York-Northeastern New Jersey Standard Consolidated Area, are reflected in Figure 5. Table 2 shows the composition of and the population in the New York-Northeastern New Jersey Standard Consolidated Area and in those metropolitan areas within New Jersey that are identified with central cities outside the state. This table also shows the population of remaining metropolitan areas in the state.

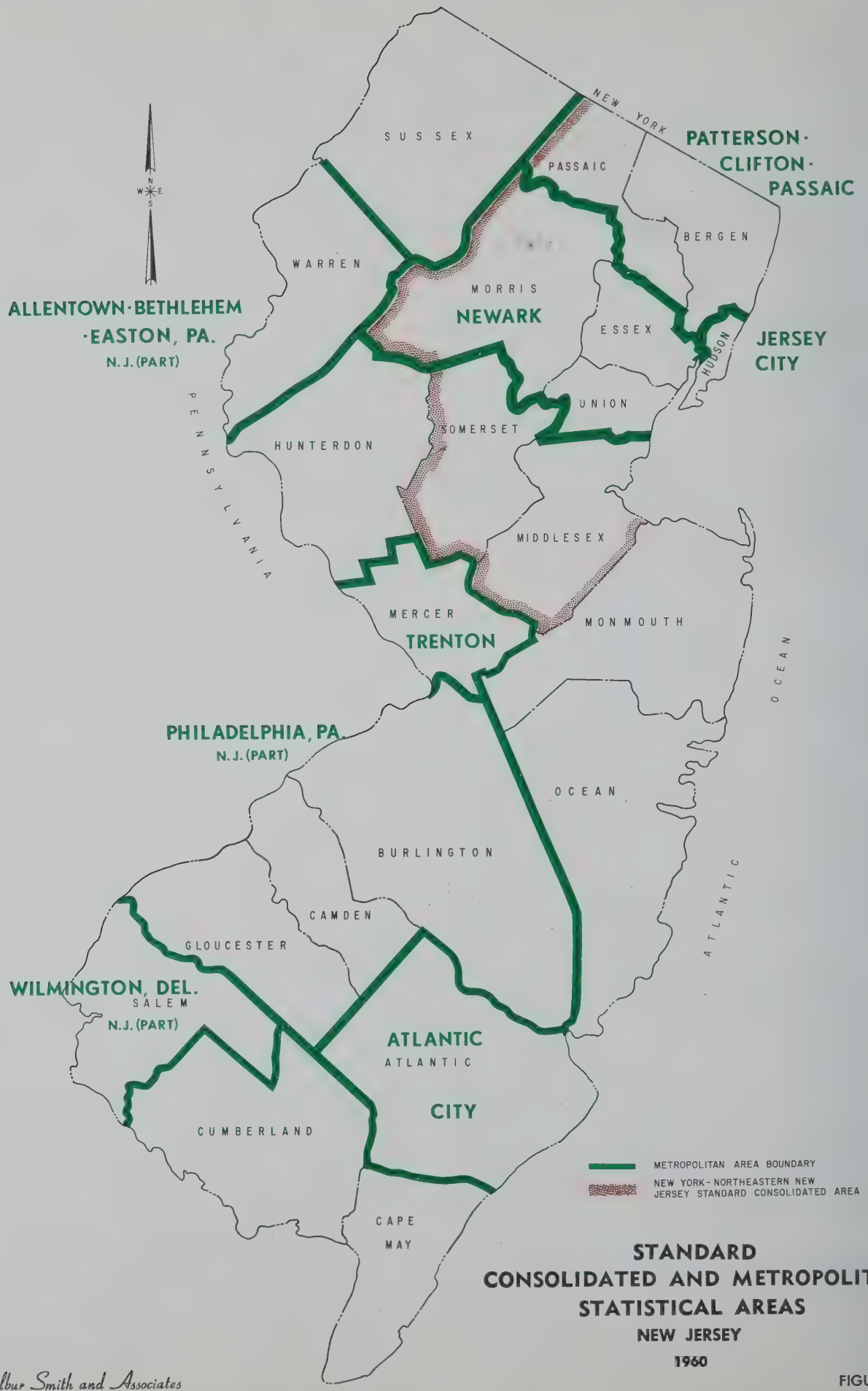
In 1960, 81.4 per cent of the population of the state was in the New York Consolidated Area and in the metropolitan areas identified with Philadelphia and Allentown, Pennsylvania, and Wilmington, Delaware. Two thirds of the state's population was in the New York Consolidated Area, 13.4 per cent in the metropolitan areas identified with Pennsylvania cities, and 1.0 per cent in the Wilmington metropolitan area. An additional 7.0 per cent was contained in the other metropolitan areas within New Jersey. Only 11.6 per cent of the population of New Jersey resided in other counties.

The growth patterns between 1950 and 1960 for all of the SMSA's in New Jersey are reflected in Table 3. The greatest growth in both numbers and percentage was in the Paterson-Clifton-Passaic and Philadelphia areas. The former increased by 311,000, 35.5 per cent and the latter by 223,000, 42.2 per cent. The Jersey City SMSA experienced a decline in population of 37,000, or 5.7 per cent.

Apparent in Table 3 are the population declines in the central cities of certain of the New Jersey metropolitan areas. This feature was accompanied by marked increases in the suburban areas outside the central cities. This process of intrametropolitan migration from central cities to suburban areas has become part of the characteristic pattern of population movement in the United States, and is very evident in New Jersey.

The population growth patterns between 1950 and 1960 in the New York-Northeastern New Jersey Standard Consolidated Area are reflected in Table 4. The New Jersey portion grew at about twice the rate of the New York portion, 21.1 per cent as compared to 11.9 per cent. Also, 38.4 per cent of the total population increase in the consolidated area occurred in New Jersey. In 1960 over one fourth, 27 6 per cent of the total population of the New York-Northeastern New Jersey Consolidated Area was in the State of New Jersey.

Age and Sex Distribution — The population of New Jersey is older than the national popu-



STANDARD CONSOLIDATED AND METROPOLITAN STATISTICAL AREAS

NEW JERSEY

1960

Wilbur Smith and Associates

FIGURE 5

TABLE 2

POPULATION OF CONSOLIDATED AND METROPOLITAN AREAS AND OTHER COUNTIES

New Jersey

1960

AREA	NUMBER	PER CENT OF STATE TOTAL
New York–Northeastern New Jersey Standard Consolidated Area		
Newark, N. J. SMSA	1,689,420	27.8
Jersey City, N. J. SMSA	610,734	10.1
Paterson-Clifton-Passaic, N. J. SMSA	1,186,873	19.6
Middlesex County, N. J.	433,856	7.1
Somerset County, N. J.	143,913	2.4
Total in New Jersey	4,064,796	67.0
Allentown–Bethlehem–Easton, Pa.–N. J. SMSA		
Warren County, N. J.	63,220	1.0
Total in New Jersey	63,220	1.0
Philadelphia, Pa.–N. J. SMSA		
Burlington County, N. J.	224,499	3.7
Camden County, N. J.	392,035	6.5
Gloucester County, N. J.	134,840	2.2
Total in New Jersey	751,374	12.4
Wilmington, Delaware–N. J. SMSA		
Salem County, N. J.	58,711	1.0
Total in New Jersey	58,711	1.0
Total Standard Consolidated Area and SMSA's with Central Cities Outside New Jersey	4,938,101	81.4
Other Metropolitan Areas in New Jersey	427,272	7.0
Total Standard Consolidated Area and SMSA's	5,365,373	88.4
Other Counties in New Jersey	701,409	11.6
TOTAL STATE POPULATION	6,066,782	100.0

[1] *1960 Census of Population, Volume I, Part 32, New Jersey,* U. S. Department of Commerce, Bureau of the Census.

TABLE 3

POPULATION CHANGES

Standard Metropolitan Statistical Areas

New Jersey

1950-1960

AREA	1960	1950	INCREASE	PER CENT
Allentown, Bethlehem, Easton, Pa. — N. J.				
Warren County, N. J.	63,220	54,374	8,846	16.3
Atlantic City, N. J. (Atlantic County)				
Total	160,880	132,399	28,481	21.5
Atlantic City	59,544	61,657	—2,113	—3.4
Outside Central City	101,336	70,742	30,594	43.2
Jersey City, N. J.				
Total	610,734	647,437	—36,703	—5.7
Jersey City	276,101	299,017	—22,916	—7.7
Outside Central City	334,633	348,420	—13,787	—4.0
Newark, N. J.				
Total	1,689,420	1,468,458	220,962	15.0
Newark City	405,220	438,776	—33,556	—7.6
Outside Central City	1,284,200	1,029,682	254,518	24.7
Essex County	923,545	905,949	17,596	1.9
Morris County	261,620	164,371	97,249	59.2
Union County	504,255	398,138	106,117	26.7
Paterson, Clifton, Passaic, N. J.				
Total	1,186,873	876,232	310,641	35.5
In Central Cities	279,710	261,549	18,161	6.9
Paterson	143,663	139,336	4,327	3.1
Clifton	82,084	64,511	17,573	27.2
Passaic	53,963	57,702	—3,739	—6.5
Outside Central Cities	907,163	614,683	292,480	47.6
Bergen County	780,255	539,139	241,116	44.7
Passaic County	406,618	337,093	69,525	20.6
Philadelphia, Pa. — N. J.				
Total	751,374	528,380	222,994	42.2
Burlington County, N. J.	224,499	135,910	88,589	65.2
Camden County, N. J.	392,035	300,743	91,292	30.4
Gloucester County, N. J.	134,840	91,727	43,113	47.0
Trenton, N. J. (Mercer County)				
Total	266,392	229,781	36,611	15.9
Trenton City	114,167	128,009	—13,842	—10.8
Outside Central City	152,225	101,772	50,453	49.6
Wilmington, Del. — N. J.				
Salem County, N. J.	58,711	49,508	9,203	18.6

[1] *1960 Census of Population, Volume I, Part 32, New Jersey,* U. S. Department of Commerce, Bureau of the Census.

TABLE 4

POPULATION CHANGES

The New York–Northeastern New Jersey
Standard Consolidated Area

1950-1960

AREA	POPULATION		CHANGE	
	1950	1960	Number	Per Cent
TOTAL	12,911,994	14,759,429	1,847,435	14.3
New York, N. Y. SMSA	9,555,943	10,694,633	1,138,690	11.9
Newark, N. J. SMSA	1,468,458	1,689,420	220,962	15.0
Jersey City, N. J. SMSA	647,437	610,734	–36,703	–5.7
Paterson, Clifton, Passaic	876,232	1,186,873	310,641	35.5
Middlesex County, N. J.	264,872	433,856	168,984	63.8
Somerset County, N. J.	99,052	143,913	44,861	45.3
TOTAL NEW JERSEY	3,356,051	4,064,796	708,745	21.1

[1] *1960 Census of Population, Volume I, Part 32, New Jersey,* U. S. Department of Commerce, Bureau of the Census.

lation. Median age in New Jersey in 1960 was 31.6 years and in the nation as a whole, 29.5 years. Figure 6 compares the proportionate age and sex distribution in New Jersey with the nation. New Jersey had proportionately more persons in the 30-74-year age groups than did the United States as a whole and was proportionately deficient in the younger age groups.

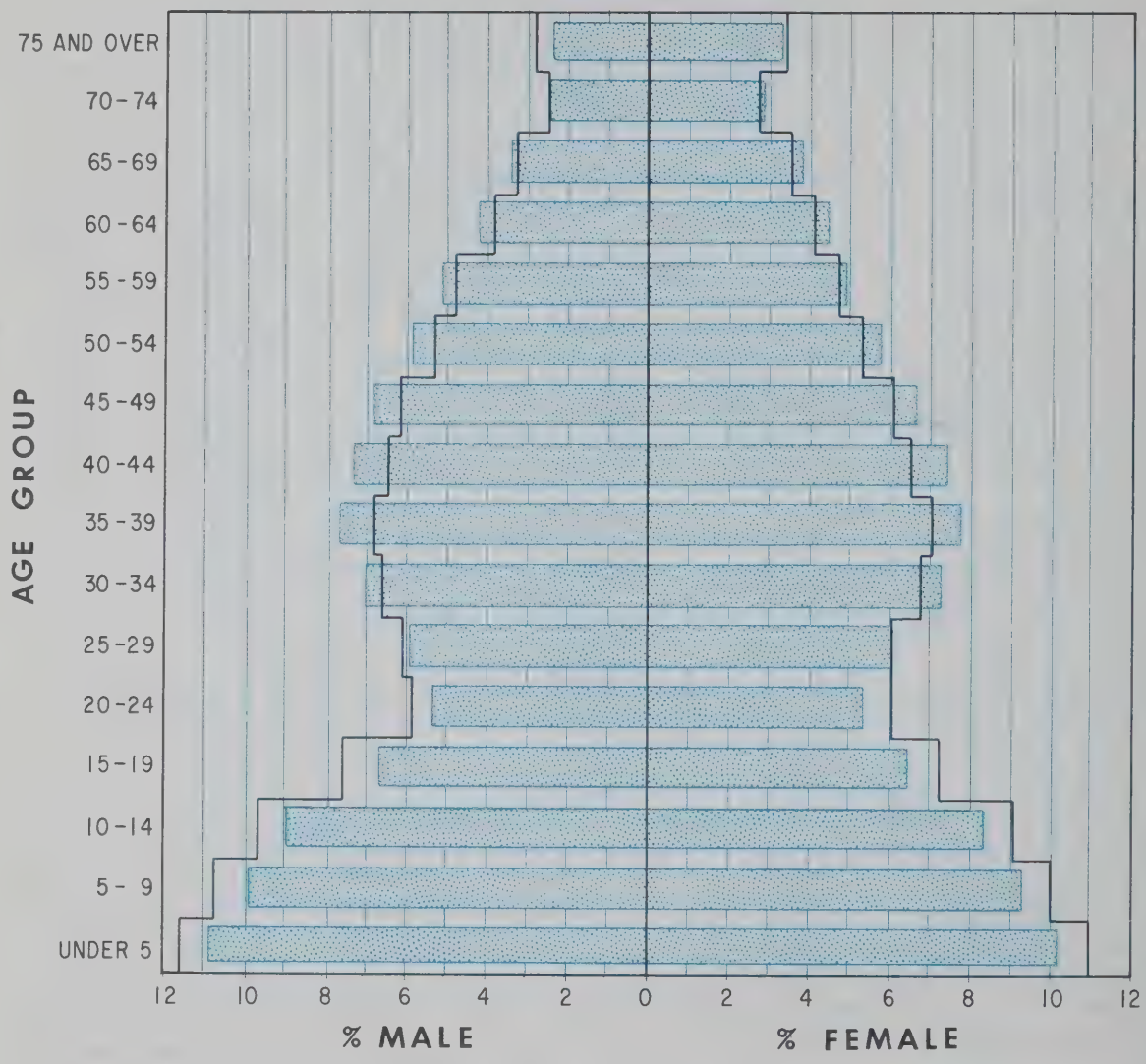
However, the state's population is growing younger. In 1950 the median age was 32.9, 1.3 years greater than in 1960. Between 1950 and 1960, the number of persons in New Jersey between ages 5 and 19 increased by 57 per cent. Nationally, the increase in this age group was only 38.7 per cent.

Employment

Estimated employment in New Jersey in 1986 will total 3,704,000, an increase of 32.7 per cent over the 1966 total of 2,791,000. In comparison, population is estimated to increase 44.6 per cent over the 1966 estimate. The difference is largely due to the increasing proportion of New Jersey population in the 14 and under age group plus an anticipated growing proportion of working age population in educational institutions.

The forecast of civilian employment by county of work for 1986 is shown in Table 5. The economy of New Jersey is estimated to grow as the national economy grows and high employment is expected to be characteristics of the future. The unemployment rate is projected at 4 per cent.

Forecast employment in each of the counties has, in part, been related to resident population. Employment estimates for counties adjacent to the New York and Philadelphia metropolitan areas reflect commutation in and out of New Jersey. Because of the location of various industries, many of the counties in New Jersey similarly reflect commutation patterns within the adjoining states.



AGE AND SEX DISTRIBUTION OF POPULATION

NEW JERSEY AND THE UNITED STATES

1960

Wilbur Smith and Associates

FIGURE 6

TABLE 5

CIVILIAN EMPLOYMENT PROJECTIONS

New Jersey Counties

1960-1986

COUNTY	CIVILIAN EMPLOYMENT 1960[1]	1986[3]
Atlantic	63,200	97,000
Bergen	[2]	389,000
Burlington	[2]	152,000
Camden	[2]	254,000
Cape May	16,800	27,000
Cumberland	47,000	77,000
Essex	[2]	539,000
Gloucester	[2]	64,000
Hudson	279,900	300,000
Hunterdon	17,900	37,000
Mercer	122,200	174,000
Middlesex	[2]	319,000
Monmouth	99,900	248,000
Morris	[2]	154,000
Ocean	31,300	115,000
Passaic	[2]	244,000
Salem	23,600	37,000
Somerset	[2]	93,000
Sussex	15,300	38,000
Union	[2]	301,000
Warren	25,200	45,000
TOTAL	2,360,200	3,704,000

[1]New Jersey Employment Security Commission.

[2]Omitted from E.S.C. estimates on an individual county basis. Included as follows:

Camden Burlington Gloucester	227,300	Middlesex Somerset	208,500
Bergen Passaic	431,900	Essex Morris Union	750,200

[3]Wilbur Smith and Associates.

Nonagricultural Employment — Table 6 shows the major sectors of nonagricultural employment in 1958 and 1965. Although manufacturing declined in relative importance, from 40.6 per cent to 36.9 per cent of total nonagricultural employment, it remains the largest single employment category in the state. Nationally the proportion employed in manufacturing was only 29.8 per cent. In absolute numbers, manufacturing in New Jersey gained 56,800 employees in the period, an increase of 7.3 per cent. Services and miscellaneous categories comprised the fastest growing single sector, 38.0 per cent. This follows the national pattern and is attributable to increasing affluence. The next fastest growing sector was government, 29.7 per cent, followed by wholesale and retail trade, 24.7 per cent.

Income

Total personal income in New Jersey has grown at about the same rate as in the United States as a whole, 43.8 per cent between 1960 and 1966, and 87.3 per cent between 1955 and 1966. This latter rate of growth is greater than in New York, Pennsylvania, or Delaware.

Per Capita Income — Table 7 shows the per capita income in New Jersey in 1966 was $3,445, similar to that in New York and Delaware and considerably more than that in Pennsylvania and in the United States as a whole. However, since 1955, growth in per capita income in New Jersey has been less than in New York, Pennsylvania, and the United States, but somewhat more than in Delaware. Since 1960, growth in per capita income in New Jersey has been about the same as New York, but less than Pennsylvania, Delaware, and the United States.

Sources of Income — As shown in Table 8, the largest single source of personal income in New Jersey was from manufacturing wages and salaries, 28.5 per cent in 1966. The next largest source was property income, 13.9 per cent, followed by wholesale and retail trade wages and salaries, 11.6 per cent.

Table 6

NONAGRICULTURAL EMPLOYMENT

New Jersey

1958 and 1965[1]

INDUSTRIAL GROUP	1958 Employment	1958 Per Cent	1965 Employment	1965 Per Cent	CHANGE 1958-1965 Number	CHANGE 1958-1965 Per Cent
Manufacturing	775,400	40.6	832,200	36.9	56,800	7.3
Mining	3,700	0.2	3,500	0.2	–200	–5.4
Contract Construction	88,600	4.6	110,000	4.9	21,400	24.2
Transportation and Public Utilities	148,200	7.8	157,000	7.0	8,800	5.9
Wholesale and Retail Trade	351,200	18.4	438,000	19.4	86,800	24.7
Wholesale Trade	89,200	4.7	111,300	4.9	22,100	24.8
Retail Trade	262,000	13.7	326,700	14.5	64,700	24.7
Finance, Insurance, and Real Estate	86,700	4.5	99,700	4.4	13,000	15.0
Service and Miscellaneous	230,500	12.1	318,000	14.1	87,500	38.0
Government	227,000	11.8	294,500	13.1	67,500	29.7
TOTAL	1,911,300	100.0	2,252,900	100.0	341,600	17.9

[1]Employment estimates are annual averages adjusted to 1965 benchmarks.

SOURCE: New Jersey Department of Labor and Industry, *Nonagricultural Payroll Employment, 1958 to 1965,* April, 1966.

Table 7

TOTAL AND PER CAPITA PERSONAL INCOME

1955-1966

YEAR	NEW JERSEY Total[1]	NEW JERSEY Per Capita	NEW YORK Total[1]	NEW YORK Per Capita	PENNSYLVANIA Total[1]	PENNSYLVANIA Per Capita	DELAWARE Total[1]	DELAWARE Per Capita	UNITED STATES Total[1]	UNITED STATES Per Capita
1955	$12,688	$2,306	$36,453	$2,283	$20,669	$1,889	$ 980	$2,519	$308,265	$1,876
1956	13,719	2,443	38,608	2,396	22,295	2,032	1,124	2,755	330,481	1,975
1957	14,550	2,536	40,818	2,493	23,414	2,137	1,125	2,641	348,462	2,045
1958	14,882	2,516	41,808	2,518	23,555	2,130	1,130	2,610	358,474	2,068
1959	15,845	2,634	44,392	2,661	24,672	2,196	1,196	2,712	380,963	2,161
1960	16,528	2,708	46,281	2,795	25,395	2,242	1,238	2,757	398,725	2,215
1961	17,336	2,765	47,939	2,746	25,696	2,257	1,269	2,759	414,411	2,264
1962	18,449	2,889	50,676	2,901	26,879	2,371	1,343	2,882	440,192	2,368
1963	19,440	2,965	52,697	2,978	27,847	2,441	1,446	3,013	463,053	2,455
1964	20,501	3,069	55,946	3,127	29,770	2,588	1,542	3,121	493,408	2,579
1965	21,950	3,237	59,350	3,278	31,816	2,747	1,706	3,392	532,147	2,746
1966	23,767	3,445	63,669	3,497	34,434	2,968	1,811	3,529	580,483	2,963
Percentage Change:										
1960-1966	43.8	27.2	37.6	27.3	35.6	32.4	46.3	28.0	45.6	33.8
1955-1966	87.3	49.4	74.7	53.2	66.6	57.1	84.8	40.1	88.3	57.9

[1]Total personal income in millions of dollars.

SOURCE: U. S. Department of Commerce, *Survey of Current Business,* August, 1967.

TABLE 8

PERSONAL INCOME BY MAJOR SOURCE

New Jersey

1960-1966

ITEM	1960[1] Amount[2] (millions)	1960[1] Per Cent of Total	1966[2] Amount (millions)	1966[2] Per Cent of Total	CHANGE 1960-1966 Amount (millions)	CHANGE 1960-1966 Per Cent
Total Personal Income	$16,256	100.0	$23,767	100.0	$7,511	46.2
Wage and Salary Disbursements	11,595	71.3	17,000[3]	71.5	5,405[3]	46.6
Farms	45	0.3	42	0.2	–3	–6.7
Mining	22	0.1	34	0.1	12	54.5
Contract Construction	653	4.0	975	4.1	322	49.3
Manufacturing	4,768	29.3	6,765	28.5	1,997	41.9
Wholesale and Retail Trade	1,953	12.0	2,755	11.6	802	41.0
Finance, Insurance, and Real Estate	508	3.1	778	3.3	270	53.1
Transportation, Communication, and Public Utilities	972	6.0	1,387	5.8	415	42.7
Services	1,234	7.6	1,994	8.4	760	61.6
Government	1,422	8.8	2,240	9.4	818	57.5
Other	17	0.1	30	0.1	13	76.5
Other Labor Income[3]	522	3.2	988	4.2	466	89.3
Proprietors' Income	1,509	9.3	1,705	7.2	196	13.0
Property Income	1,972	12.1	3,315	13.9	1,343	68.1
Transfer Payments	1,017	6.3	1,540	6.5	523	51.4
Less Personal Contributions for Social Insurance	360	2.2	781	3.3	421	116.9

[1]Statistical abstract of the United States, 1962.

[2]U. S. Department of Commerce, *Survey of Current Business*, August, 1967.

[3]Comprises employer contributions to private pension, health, and welfare funds; compensation for injuries; pay of military reservists; directors' fees; and several other minor items.

Highway Needs

Highway needs are closely related to economic growth, population changes, employment, production of consumer and durable goods, length of work week, income, and styles of living.

Benefits — The benefits of improved highways are generally divided into direct and indirect categories. Direct benefits include savings in operating costs, accident cost savings, and the value of the time saved in operating a vehicle over superior highway facilities. Increased comfort and convenience are also important benefits.

Of particular interest are the indirect benefits, which in many situations are substantially greater than direct benefits. These benefits are difficult to assess because they are an integral part of total productive activity. Many studies have been made to delineate the advantages and disadvantages to areas from different kinds of highway improvements and to evaluate their impact on economic activity. These studies generally considered specific improvements and took the form of "before" and "after" studies of land use, the types and levels of business activity, land values, and other criteria.

More important and more difficult to assess is the general economic impact of all highway improvements, and the quantitative relationships of highway needs and the economy of an area.

Highways, in a sense, do not automatically cause economic expansion. Rather, they affect the channeling of land development and help satisfy needs created by population increases,

New Jersey has long been one of the nation's leading industrial states and ranks seventh in value added by manufacturers. Almost all short hauls and a substantial portion of long hauls transporting New Jersey products to markets across the country are handled by trucks. As a result, high volumes of truck traffic occur on almost all major segments of the highway system.

industrial expansion, underdeveloped material resources, or unused human resources. Where conditions are favorable for economic expansion, highways can provide the necessary economic stimuli.

The location of industries on improved highways makes it possible to increase accessibility to sales areas, labor markets, supplies, and raw material. Good accessibility may also increase the amount of land available for productive use by opening new areas or by converting occupied land to higher use.

In addition, improvements in highway transportation reduce the costs of marketing products in areas where decentralization has widened many market areas. Efficiencies have also been effected by the locating of plants in areas where adequate land can be acquired at reasonable costs.

Employees commuting over improved highways benefit from reductions in operation costs, accident costs, time cost, and driver strain. Good transportation also permits added flexibility in selection of home sites.

The economy, speed, and flexibility of highway transportation has been a major factor in the past economic development of New Jersey. It will be an equally important force in the future.

OTHER TRANSPORTATION MODES

Chapter 3

In the analysis of highway needs, it is extremely important that the role played by highways and streets be placed in perspective in relationship to the total transportation system. The principal modes of transportation in New Jersey were considered as a total system, and their impact on highways and streets was evaluated in the process of functionally classifying all highway and street systems in the state.

While it was not an objective of the New Jersey Highway Needs and Fiscal Study to analyze improvement requirements for other modes of transportation, it was essential that a knowledge of the interaction of all modes be a part of the basic data of the study.

In the following sections, rail, water, and air facilities in New Jersey are described as they presently exist, and as firm plans for improvements have been developed. As additional changes in the systems of the various modes of transportation evolve, their impact on the total network of all modes must be appraised, in order that the ultimate objective of a balanced transportation system may be achieved.

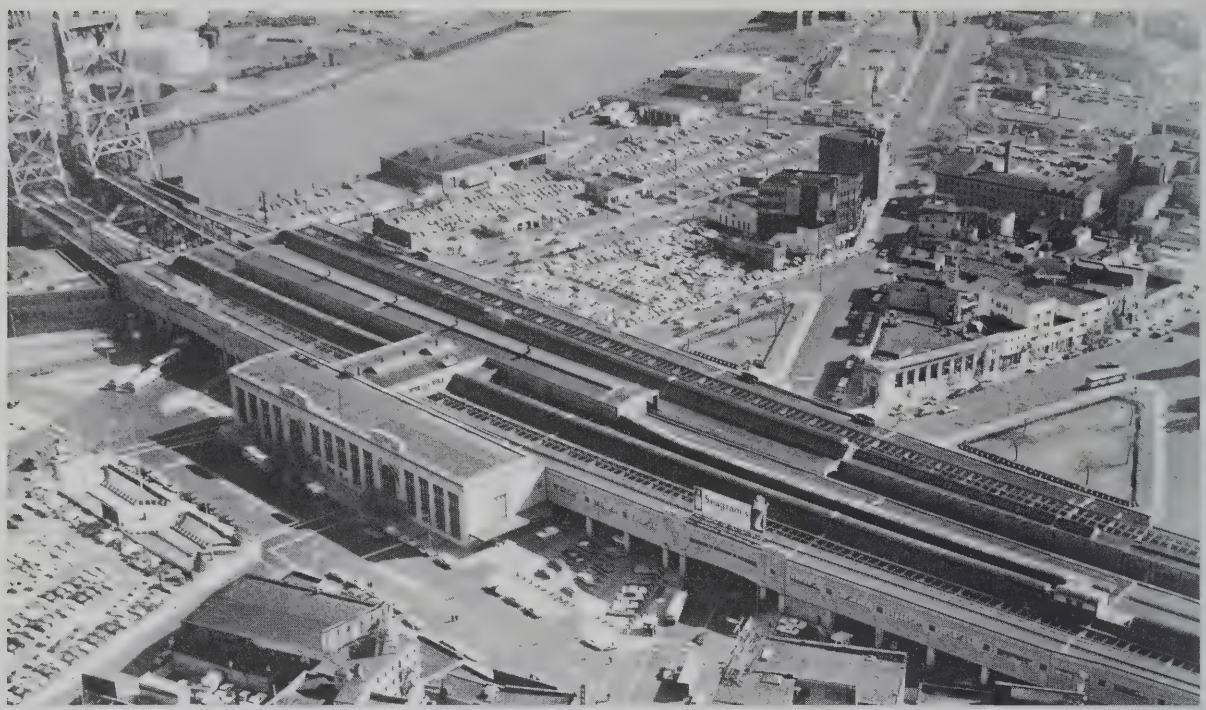
Rail Transportation

There are now 24 railroads operating 2,109 miles of track in New Jersey. Ten of these railroads are Class I carriers operating over 1,885 miles of track. The other 14 are Class II railroads having a total of 224 miles of track in operation. In the second group are two old-fashioned steam railroads (Black River and Western, and the Morris County Central Railroad) that are amusement lines. Four railroads, with a total of 1,450 miles, control over two thirds of all operating tracks in the state. These are:

RAILROAD	*MILES OF ROAD OPERATED IN NEW JERSEY*
Central Railroad of New Jersey	396
Pennsylvania Railroad	378
Pennsylvania-Reading Seashore Lines	341
Erie-Lackawanna Railroad	335
TOTAL	1,450

All four of these carriers provide passenger and freight service. The fifth major rail passenger service in New Jersey is operated by the Reading Company. In a lesser category, the Staten Island Rapid Transit Railway Company operates about 5 miles of track between Cranford Junction, Union County, and the New York state line.

No statistics are available on a statewide basis that report the total of revenue passenger-miles



New Jersey has almost equal mileage of railroad track and state highways, indicating the prominent position of rail transportation to the total transportation network. In fact, New Jersey has more miles of railroad per square miles of land area than any other state in the nation. Highway service to rail terminals is necessary for movement of people and goods.

or the total freight ton-miles hauled, so it is impossible to compare New Jersey with other states in these respects.

Hudson River Crossings — There are no railroad bridges across the Hudson in the New York City area. The Pennsylvania Railroad tunnel accommodates passenger trains between Penn Station in Manhattan and Newark, but there is not sufficient clearance to move freight trains.

The Port Authority Trans-Hudson tubes (PATH) constitute the only other uninterrupted means of rail transport across the Hudson. Technically, however, PATH is a rapid transit system, not a railroad. Formerly known as the Hudson and Manhattan tubes, this system extends from Newark through the Jersey City-Hoboken area, then beneath the Hudson River to downtown and midtown Manhattan. It was acquired by the Port of New York Authority, which is modernizing its stations and equipment.

Rail passenger service on the Erie-Lackawanna terminates at Hoboken and on the Central Railroad of New Jersey (Jersey Central), it ends at Jersey City. Until midyear 1967, passengers for New York City transferred to the railroads' ferries at both locations. At one time they were thriving operations but since World War II, the patronage has declined and ferry equipment and service have deteriorated. During 1967, the Aldene Plan (described below) became effective and now Jersey Central train passengers transfer to other carriers at Newark.

All rail freight between New York City and New Jersey (including all rail freight to and from the South and West) must cross the Hudson River or Upper New York Bay by float or lighter. To accommodate transfer of freight, the railroads own large tracts for yards and port facilities extending from Edgewater south to Perth Amboy, and also along the shoreline from Weehawken to Bayonne. The Pennsyl-

vania Railroad, the largest carrier, on a typical weekday transports thousands of tons of freight across upper New York Bay from its Greenville piers near the Jersey City-Bayonne line to the Long Island Railroad piers at Bay Ridge in Brooklyn.

Railroad use of the northern New Jersey waterfront is declining because of the trend toward consolidation of marine and lighterage operations, merger of railroads (thus eliminating the duplication of facilities), and closing of military terminals. At the end of World War II, railroads owned 96 per cent of the Jersey City harborfront. This now has declined to about 40 per cent. Title on most of the land has reverted to the city. Much of this land contains deteriorated facilities.

State Aid to Railroads — New Jersey has more miles of railroad per square mile of land area than any other state in the nation. In the years following World War II, their financial plight worsened as railroads felt more acutely the competition from other carriers. It became evident that some form of government assistance was needed if they were to survive. In March, 1959, the State Legislature created a Division of Railroad Transportation within the State Highway Department and directed the Division to make "a continuous study of the commuter and passenger railroad operations throughout the state for the purpose of seeking solutions to the various problems" confronting railroads and their passengers. In its report to the governor and State Legislature the Division stated:

> New Jersey has for a considerable period been in the throes of a transportation crisis. Its highways have long since reached the point of over saturation. Railroads providing suburban train service have been curtailing their operations, foregoing desirable maintenance and raising fares in futile attempts to neutralize the deficits of passenger service. With each curtailment and rate increase, more commuters resort to highway travel, thus compounding the problem. The law of diminishing returns has caught up with us.

The report continued:

> The 'mass transportation' crisis had its origin many years ago. It has been a cumulative situation reflecting not only growing population but changing travel habits. It is also the result of our higher standard of living, mounting prosperity, shorter work week, and the fact that automobiles are now considered a necessity . . .
>
> A progressive and realistic transportation philosophy was crystallized by the State Highway Department to the effect that the Department's responsibility is to provide for the movement of people as well as the movement of vehicles. With the adoption of this philosophy, it was recognized that the suburban railroads were an essential ally of the state highway system, for if the daily service to rail passengers were suddenly to cease, traffic conditions in the metropolitan areas, already intolerable in commuter hours, would become chaotic.[1]

In response to a detailed questionnaire sent to the 10 rail passenger carriers by the Division, it was reported that these carriers had total deficits exceeding $27,000,000 in 1959. Some railroad officials said that freight revenues had been bearing the cost of passenger losses since 1939; others indicated that passenger service had not been profitable since 1929.

After examining the financial position of the rail carriers, the Division of Railroad Transportation recommended to the State Legislature that $6,000,000 be appropriated for fiscal year 1960-61 "for service contracts with all New Jersey rail passenger carriers except the Hudson and Manhattan." In agreeing to the terms of the contract, each carrier would maintain a specific timetable of service and adhere to a definite schedule of fares in return for payments from the state to reimburse the carrier for deficits incurred in its passenger service.

The State Legislature adopted this recommendation and approved the necessary funds for 1960-61. This method has proved successful, for it provides much-needed financial assistance to the rail passenger carriers and enables the State of New Jersey to have a measure of control over rail passenger fares and service. It has been continued annually since 1960 through yearly appropriations made to the Division of Railroad Transportation to enable it to enter into these contracts.

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[1] *New Jersey's Rail Transportation Problem*, Division of Railroad Transportation, April, 1960.

The 1960 report of the Division of Railroad Transportation contained several other salient recommendations concerning the Aldene Plan and the Camden and Kirkwood Rapid Transit Line, which are discussed in detail later in this section. It also made certain recommendations regarding the Hudson and Manhattan tubes which since have been acquired by the Port of New York Authority.

The Aldene Plan — The Aldene Plan involves interconnection of tracks between the Central Railroad of New Jersey and the Lehigh Valley Railroad at the small station of Aldene, 1.5 miles from Cranford in Union County. Under this plan, the Jersey Central trains north of Aldene travel over the Lehigh Valley tracks between Aldene and South Newark, switch to the Pennsylvania Railroad tracks in South Newark, and terminate their runs at the Newark Station. At Newark, passengers bound for New York City change to other trains or use PATH tubes.

The New Jersey State Legislature, at the recommendation of the Division of Railroad Transportation, appropriated funds to interconnect these tracks and eliminate a major grade crossing in this area because of improvements in service and economies in operation that would be achieved. By June, 1967, the interconnection was complete and the Jersey Central trains began using the Lehigh Valley tracks.

The purposes motivating this plan are to eliminate duplicate rail facilities and to permit abandonment of outmoded and antiquated facilities of the Jersey Central Railroad. The railroad will be able to dispose of extensive land holdings in Jersey City, and its ferry terminal in Manhattan. Passengers will benefit from faster train service. PATH should experience a substantial increase in its trans-Hudson commuter traffic.

Rapid Transit Line to Kirkwood — In the Camden area, construction is underway on a new rapid transit line that will extend from Center City Philadelphia, cross the Delaware River via the Benjamin Franklin Bridge, pass through Camden, and proceed in a southeasterly direction through Collingswood and Haddonfield to a terminal at Kirkwood in the borough of Lindenwold. The project is 14.4 miles long.

The Delaware River Port Authority made an intensive study of this and several other corridors before this route was actually selected. Intergovernmental cooperation was needed to make the plan feasible. The City of Philadelphia, as part of its subway modernization program, consented to pay the cost of improvements necessary to accommodate the line in the Philadelphia subways. This required platform installation and new tracks at the Eighth and Market Street Station. When an engineering study indicated the cost of improving this station would be much more expensive than the city expected, the Delaware River Port Authority agreed to contribute part of the cost. New Jersey agreed to bear the cost of providing grade-separations along the right-of-way of the Pennsylvania-Reading Seashore Lines, where the rapid transit line is located, between Camden and Kirkwood. Other expenses are being paid from surplus revenues of the Delaware River Port Authority which derives its income from tolls charged on the Benjamin Franklin and Walt Whitman bridges.

The City Hall and Broadway stations in Camden are to be modernized during the construction stage. At the Kirkwood terminal, passengers may transfer to trains of the Pennsylvania-Reading Seashore Lines bound for Atlantic City and the South Jersey Shore. It is estimated that the running time from Kirkwood to Eighth and Market streets, Philadelphia, will be 22 minutes, about half the time now required for a bus trip over that route.

Commuter Operating Agency — In 1966 the State Legislature created the New Jersey Department of Transportation and established the Commuter Operating Agency to function as an important component of the new department. The agency is composed of four members: the Commissioner of Transportation, the Assistant Commissioner for Public Transportation, the State Treasurer, and the President of the Board of Public Utility Commissioners, or persons whom they designate to serve in their stead. The Commissioner is authorized to designate an executive director.

The law specifies that:

The Agency annually shall investigate and determine the financial results to each rail carrier from providing passenger service during the previous calendar year and determine what action is required for each carrier to offset all or part of any loss shown. Such determination may include but shall not be limited to (a) changes in service, fares, operating procedures, and routings; (b) improvements to capital facilities; and (c) compensation by the state to be rendered under a contract. The determination shall list the passenger service to be operated by a carrier under a contract and shall specify the fares to be collected for such passenger service; it shall also contain a list of projects to carry out the objectives of this act for which the Commissioner recommends the use of public funds.

Provisions are also included in the law specifying that public hearings may be held before making such determination and that all determinations "be made public and filed with the Secretary of State not later than June 15 in each year." The Agency is authorized, acting on behalf of the State of New Jersey, to "enter into contracts with any rail carrier, providing for acceptance by such carrier of all or any part of the Agency's determination. Certain terms that every such contract must include are spelled out in the law. If the agency is satisfied that the railroad has complied with terms of the contract, the state is obligated to pay it the amount agreed on in the contract. The agency is granted broad powers to enable it to enforce provisions of the law.

In addition, the Commuter Operating Agency can contract "with any motor bus carrier to operate passenger service (a) in lieu of railroad passenger service whenever the latter is terminated subsequent to the effective date of this act, or (b) from and to railroad stations as part of an integrated service." In this instance, the agency shall pay the bus carrier for the actual cost of the service "plus a 6 per cent return on investment." The act also gives the agency authority to "acquire, purchase, or rehabilitate motor buses for lease" to any motor bus carrier for use in "specified passenger service, provided that any state funds expended for such programs are at least equally matched by federal funds."

There are five major rail passenger carriers in New Jersey providing essential commuter service between urban centers. Present plans to improve commuter service include high-speed rail service in Megalopolis, improvement of stations, and new and better equipment. Coordination of highway plans and rail service will provide convenient access to stations, bus transportation, and adequate supplies of parking space.

Commuter Advisory Committee — A separate section of the Department of Transportation Act establishes a Commuter Advisory Committee as a distinct and separate entity, not to be confused with the Commuter Operating Agency. The Commuter Advisory Committee consists of a panel of 10 members appointed by the Governor and headed by the Assistant Commissioner for Public Transportation. The purpose of the Committee is to "consult with and advise the Commissioner (of Transportation) with respect to the affairs and problems of commuter railroads."

High Speed Rail Service in Megalopolis — New Jersey is strategically located near the center of Megalopolis — the super city extending from Boston to Washington. For several years, high speed rail service has been studied as a means to serve the growing demands for transportation of passengers. Recognizing this as an interstate problem, the United States Congress

directed the Department of Commerce to take the necessary steps with regard to high speed rail service.[2] Since greatest traffic volumes exist in the Washington-to-New York City Corridor, priority was given to this section.

Through consultation with the states, cities, and transportation interests (primarily the Pennsylvania Railroad, the principal rail carrier serving this corridor), a route was selected and plans formulated for implementing this program.

Equipment, especially designed for this service, has been ordered. Improvements are being made to the roadbed, including laying of long rails capable of carrying high speed trains with as smooth a ride as possible. In some cases, platform improvements are being made.

Long-Range Plans — If railroads are to attract more passengers, improvements are needed in service and facilities. To provide these improvements, governmental subsidies are needed.

Coordination of highway and rail service is essential. Rail will normally be much better patronized if stations are convenient to major highways, if they are well served by bus transportation, and if they have adequate parking space.

Rail service can also be made more attractive if old stations are modernized or replaced. The State of New Jersey has appropriated funds to make certain improvements in rail terminal facilities in Trenton. Consideration is also being given to locating a new station at the intersection of the Pennsylvania Railroad's main line with a major artery or arteries in northern New Jersey.

Other long-range plans include the transporting of private automobiles on special flat cars designed to carry passengers and vehicles over substantial distances.

Water Transportation

The two major port areas in New Jersey combine to make it one of the nation's leading states in the movement of foreign and domestic waterborne commerce. Northeastern New Jersey is an important component of the Port of New York. The Delaware River Port serves New Jersey and Pennsylvania.

Deep-water port facilities in northeastern New Jersey reach from Edgewater, south of the George Washington Bridge, to the Amboys at the mouth of the Raritan River. They include the Hudson River, Upper New York Bay, Kill van Kull, Newark Bay, the Hackensack River, the Passaic River, Arthur Kill, and the Raritan River and Bay. Most shipping activities are concentrated along the Weehawken-Hoboken-Jersey City-Bayonne harborfront and in the Newark Bay area.

[2]This function has been transferred to the Department of Transportation.

New Jersey is a leading state in the movement of foreign and domestic waterborne commerce with most of this activity occurring along the waterfronts of the Port of New York and the Delaware River Port. These port facilities handle a wide variety of general cargo, bulk cargo, and containerized cargo. Other modes of transportation — rail, highway, and pipeline — provide movements to and from the port facilities.

The New Jersey side of the Delaware River Port extends from Trenton, the head of navigation on that river, to the confluence of the Salem and Delaware rivers. The major shipping facility in this area is the Camden Marine Terminals administered by the South Jersey Port Commission.

Along the Jersey shore, the Intracoastal Waterway weaves from the Point Pleasant area down the coast through a series of canals, bays, harbors, and inlets to a point near North Cape May where it emerges to cross Delaware Bay. It is used extensively by small craft for recreational purposes.

Other stretches of the Jersey Coast have fishing and recreational piers, docks, and marinas. All significant waterborne commerce, however, is concentrated in the Port of New York and the Delaware River Ports.

The Port of New York — Northeastern New Jersey's waterfront is so intricate a part of the Port of New York that it is difficult to study as a separate entity. The present complex of docks, piers, industries, refineries, and railroad facilities that line the waterways evolved through a series of stages in the historical and economic development of the nation and the region.

The New York area has ranked as a major seaport from colonial times. Many of the nation's earliest industries were located along its river and bays which provided convenient transportation. However, these waterways presented a natural barrier to growth of rail transportation. Railroads constructed freight yards and terminals on the New Jersey side of the Hudson River and Upper New York Bay and provided ferry service for passengers and floating barges for freight cars to transport them to New York City. Large tracts of New Jersey's waterfront are owned by railroads. The development of motor vehicles and the ease with which they could cross the Hudson by bridge or tunnel enabled trucks to compete with railroads for the movement of freight within the port. Also, increased demand for petroleum products induced oil companies to locate huge refineries on waterways where tankers could easily deliver crude oil.

While these developments were taking place, large numbers of immigrants were arriving at Ellis Island, less than a mile from the Jersey City shoreline. Many of these future citizens stayed in northeastern New Jersey and found jobs at the industries, railroads, refineries, and port facilities along the harbor. They knew little of the land, and in many cases the language, so they settled as closely as possible to their work.

By the 20th century, northeastern New Jersey had become a vast urban region sprawling behind an intensely developed harborfront. Thus, the New Jersey area of the Port of New York was shaped and molded through a series of stages into the massive complex it is today.

In "The Changing Harborfront," the Tri-State Transportation Committee states:

> Shipping activity in the Port of New York encompasses oceanborne passenger movements, oceanborne commodity movements, intraport passenger movements, intraport commodity movements, and military movements. Each of these calls for a different type of facility on the waterfront. Therefore, it is common to study terminal needs for each of these movements separately.

Oceanborne and intraport (water) passenger movements are not very important in the New Jersey section of the Port of New York. Large passenger liners dock on the Manhattan side of the Hudson River. Ferries operated by the Central Railroad of New Jersey were taken out of service as the Aldene Plan (discussed in the railroad part of the text) became effective.

The port facilities along New Jersey's waterfront are highly diversified so that they can handle a wide variety of general cargo, bulk cargo, and containerized cargo.

The Hoboken-Port Authority Marine Terminal, owned by the Port of New York Authority and leased to American Export-Isbrandtsen Lines, Inc., is one of the most modern and active general cargo facilities in the area. In 1965, 290 vessels berthed at the terminal. The Port of New York Authority spent $18,000,000 in developing the terminal facility.

The busiest of the Port Authority's marine terminals is Port Newark, which handled almost 3.9 million tons of cargo in 1965, consisting of 2.9 million tons of general cargo, and more than 9 million tons of bulk liquids. In 1965, over 4,700 persons earned more than $26,300,000 at this seaport. It is the leading port in the nation in automobile imports and imported frozen meats. The recently completed Port Newark Refrigerated Warehouse has been designated as "Identification Service" facility by the U. S. Department of Agriculture which eliminates the need for another inspection of imported meat by the Department of Agriculture at the consignee's plant.

The third New Jersey facility owned by the Port of New York Authority is the 703-acre Elizabeth-Port Authority Marine Terminal, which is being developed to handle containerized cargo. This port is presently engaged in a five-phase construction program. Almost the entire 111 acres completed in the first construction phase are occupied by Sea-Land Service, Inc., the world's leading containership operator. The strong trend to containerized cargo indicates that the Elizabeth-Port Authority Marine Terminal faces a bright future.

Petroleum products constitute the major cargo movement in the port. Humble Oil Refining Company owns one of the largest tracts on the waterfront at Constable Hook in Bayonne; it also has a large refinery at Linden. The Arthur Kill has several important petroleum refineries lining its shore.

Cargo, such as coal, bananas, and sugar, is handled at special piers or berthing facilities. New Jersey also has some docks equipped with grain elevators. Grain traffic has declined in recent years because substantial grain shipments are made through the Great Lakes ports and the St. Lawrence Seaway.

The Tri-State Transportation Committee estimates that "between a quarter and a third of all conventional cargo shipped through the Port of New York comes to, or leaves, the Port district by railroad." Marine equipment, usually lighters, moves most of this freight from the railroad terminal to the steamship terminal. Tri-State recommends that it would be more efficient if the lighterage stations operated by individual railroads in New Jersey were consolidated in the Morris Canal area of Jersey City.

Tri-State proposes that interchange floats (transfers across the water to other railroads) be concentrated at the Greenville piers and that station floats (which move goods to Manhattan for distribution in the region) operate from Harsimus Cove and Communipaw. All these sites on the Jersey City waterfront contain railroad docks and yards.

New Jersey's Division of State and Regional Planning (recently transferred from the Department of Conservation and Economic Development to the Department of Community Affairs) issued a detailed report in 1962 on *Waterfront Utilization in North-East New Jersey.* It found that while much of the harborfront is intensely used, redevelopment is necessary to revitalize certain areas. The report recommended a coordinated approach to waterfront development and indicated there is a growing need for exclusive waterfront zoning.

Tri-State has pointed out also that port activities can be consolidated and relocated on less acreage than they now occupy and yet operate more efficiently. Land that shipping and railroad interests find surplus to their needs is usually cluttered with deteriorated facilities and is not attractive to industries which prefer the relatively less expensive, "clean" land of suburbs. Weighing these considerations, Tri-State concludes that "the redevelopment of harborfront land must be directed toward residential and recreational uses." Hoboken already has several high-rise apartment houses under construction along its harborfront.

If the consolidation of rail-water facilities recommended by the Tri-State Transportation Committee becomes effective, large tracts of railroad lands should be available for redevelopment. The actual acreage needed for port facilities is declining, and inasmuch as industry prefers to locate in suburbs, apartment developments will probably be built on redeveloped land along the New Jersey side of the Hudson River and Upper New York Bay.

The Delaware River Port — In 1926 the New Jersey Legislature established the South Jersey Port District comprising counties bordering on the Delaware River and Bay from Mercer to Cape May. The South Jersey Port Commission was created to exercise jurisdiction over "the survey, development, control, and operation of port facilities, in such port district and the coordination of the same with existing or future agencies of transportation with a view to the increase and efficiency of all such facilities and the furtherance of commerce and industries in the district" and to construct, operate, and maintain port facilities.

Although this mandate is extensive, the main activity of the South Jersey Port Commission has been the operation of the Camden Marine Terminals and the Beckett Street Terminal, the major facility under the Commission's jurisdiction, which was opened in 1931. It was financed by the sale of $2,000,000 South Jersey Port District Marine Terminal Series A Bonds, amortized at $50,000 per year, with the final payment due in 1973. Property of the Port District covers about 66 acres. The total water frontage of the Camden Marine Terminals at the pierhead line is in excess of 2,200 feet. On the New Jersey side of the Delaware River, this is the only active facility for general cargo and also the only publicly-owned and operated marine facility open to all on equal terms. In addition to general cargo, it handles substantial amounts of lumber and is the only port in the area capable of providing facilities for handling of nitrate of soda (used as fertilizer by the farmers of New Jersey and eastern Pennsylvania).

In its Annual Report for 1965, the South Jersey Port Commission said, "The Beckett Street Terminal has been operated at full capacity, yet it has been necessary on many occasions to refuse business owing to lack of berthing or transit shed space . . . There are times when the management must refuse consignments proffered for storage."

General port promotion activities are the responsibility of the Delaware River Port Authority, a bi-state agency created under a compact between the Commonwealth of Pennsylvania and the State of New Jersey. Its territory includes the New Jersey counties from Burlington south to Cape May and Philadelphia and Delaware counties, Pennsylvania. It also has jurisdiction to construct and operate trans-Delaware crossings within the port district and to establish and maintain an interstate rapid transit system. The Delaware River Port Authority states that "its present port promotional effort is geared to a Trenton-to-the-Sea concept which recognizes that economic betterment in one segment of the community spills over to the others."

Air Transportation

Development of aviation in New Jersey can be traced to World War I when planes were manufactured in Plainfield, Keyport, and Elizabeth. New Jersey's first municipal airport opened in Atlantic City in 1919. Teterboro Airport became operational in 1926.

Newark, New Jersey's leading commercial airport, began operations in 1929. For 10 years, until LaGuardia Field opened in 1939, Newark was the only airport in the metropolitan New York area that handled scheduled airline flights. At that time it was the busiest airport in the world. Owned by the City of Newark and now operated by the Port of New York Authority, it has expanded considerably in its almost 40 years of operations and continues to be one of the nation's most important commercial airports.

New Jersey now has 79 airfields, 68 licensed private aviation facilities, and 89 helicopter landing strips, for a total of 236 air facilities.

Among the 79 airfields are included two military airports (McGuire Air Force Base and the Lakehurst Naval Air Station) and also the National Air Facilities Experimental Center at Pomona which is controlled by the Federal Aviation Agency. Newark and the N.A.F.E.C. are capable of serving large jet flights, but only Newark has scheduled commercial jet service. Besides Newark, scheduled airlines provide limited service to three other New Jersey airports in Mercer County, Atlantic City (Pomona Airport), and Cape May County. (The Cape May County Airport has commercial flights during the summer tourist season only.)

New Jersey has scheduled airline service to four cities with the most important airport serving Newark. During its early years, Newark was the busiest airport in the world and today continues to be one of the nation's most important commercial airports. In addition, New Jersey is served by a number of general aviation airports which primarily serve business, commercial, and pleasure flying.

General Aviation Airports — With 236 air facilities, New Jersey would appear to be adequately served. However, the significance lies not in the total but in the type, geographical location, and general level of adequacy of these facilities.

In the past few years, attention has been focused on need for more and better general aviation airports in New Jersey. These are airfields that primarily serve business, commercial, and pleasure flying. (Usually they do not have scheduled airline service; if they do, it is on a limited basis.)

Tri-State Transportation Committee Study — The Tri-State Transportation Committee has conducted an intensive study of aviation facilities in the Connecticut-New York-New Jersey area surounding New York City. The New Jersey part of the study area encompasses 10 counties which include all of northern New Jersey extending south through Mercer and Monmouth counties except for the three western counties of Sussex, Warren, and Hunterdon. In a report titled "General Aviation, Airports for the Future" issued in March, 1965, the Tri-State Transportation Committee expresses this opinion:

> . . . The time has arrived when a clear-cut public policy is required if the region is to have a system of airports capable of meeting the needs for future general aviation flying. General aviation flying is an increasing part of the business and recreational life of this region and sound planning requires that coordinated federal, state, and local policies and programs be developed to meet this new set of transportation demands. This cannot be done successfully on a piecemeal or sector-by-sector basis. A regional approach and a regional plan are essential.

The study recommends a regional system of 32 "publicly owned, well equipped, and strategically located airports." Three major Port of New York Authority airports (John F. Kennedy International, LaGuardia, and Newark) are designated as the hub of the system, supplemented by 14 primary and 15 secondary general aviation fields distributed throughout the area.

Of the 14 primary general aviation fields, Tri-State recommends that 5 be developed in New Jersey at these locations:

1. Monmouth County Airport,
2. Mercer County Airport,
3. Teterboro Airport (Bergen County),
4. Morristown Municipal Airport (Morris County), and

5. In the general area of New Brunswick and Somerville.

These airports should be able to accommodate large general aviation aircraft used in private and business flying and also aircraft used in local scheduled airline service. Runways should be 5,000 to 6,000 feet long, and provisions should be made for instrument landing systems.

Of the 15 secondary airports recommended by Tri-State, 4 are in New Jersey:

1. Linden Airport (Union County),
2. Princeton Airport (Mercer County),
3. Site in northern Monmouth County, and
4. Site in Towaco-Lincoln Park (Morris County) area or Totowa-Wayne (Passaic County) area. (Depending upon the location and adequacy of the facility, two airports may be needed here.)

The secondary airfields should have paved runways at least 3,000 feet long with space available to lengthen them to 5,000 feet. They can relieve the primary airports of training and instructional flights during periods when congestion problems develop in the primary fields.

Regional Plan Association — On February 22, 1967, the Regional Plan Association urged the governors of Connecticut, New York, and New Jersey to start immediately on a system of special airports for general aviation flying as recommended by the Tri-State Transportation Commission. It pointed out that, by providing a network of good general aviation fields, the use of business and private planes at the three major airports (Kennedy, LaGuardia, and Newark) can be limited, especially during periods of peak congestion. Using estimates prepared by the Port of New York Authority, the Regional Plan Association said that these three major airports will have enough capacity to handle predicted airline travel increases through 1980 if general aviation planes can use other fields.

General Aviation Plans Outside Tri-State Area — Elsewhere in New Jersey (outside the Tri-State Study Area), general aviation facilities are under construction or being seriously considered. Ocean County is building a general aviation field at Berkeley Township. Camden County is actively searching for a satisfactory site. Gloucester County is considering one. Salem County is interested in a new airport but is not certain it can be justified. The site of a new airport in the Phillipsburg area needs to be coordinated with plans for the Tocks Island Reservoir; at present these plans are not firm enough to select a location.

Plans for Newark Airport — The port of New York Authority plans to extend one runway at Newark Airport to 9,000 feet and another to 9,500 feet so it can accommodate larger aircraft safely.

Proposed Jetport — Overshadowing all these planned and projected improvements, however, is the long-range need for another major jetport to serve northern New Jersey and the New York City area. Because of the complexities involved, it is estimated that even if a site were selected in 1967, a jetport could not be completed before 1975, and quite possibly several years later.

Although New Jersey has several sites generally suitable for a new jetport, the strong resistance that has arisen against each site has complicated the selection. Congestion of the airways over New Jersey has also hindered site selection. At present planes from the South and West are channelled into the three major New York area fields along airways that build up in intensity as they cross New Jersey. Recently, the Eastern Regional Director of the Federal Aviation Agency, Oscar Bakke, said that the FAA is willing to change the travel patterns over any site to assist in planning the new jetport.

It is not within the scope of this study to evaluate the good and bad features of the various sites. However, one of the major factors in selecting a place for the new jetport should be the availability of adequate land transportation facilities, for if they are not convenient to the site, they must be built. It is essential that airline passengers travel as quickly and efficiently as possible between the jetport and urbanized northeastern New Jersey. Furthermore, the jobs created by a jetport will generate substantial volumes of travel in the

area. It is estimated that there will be 30,000 "on-site" jobs and 16,000 "off-site" jobs, and in total the new facility will provide income to 134,000 workers. Not only will this require an adequate highway network, but consideration must be given to mass transportation facilities.

Speaking on problems that will confront jetports in the future, Oscar Bakke said (in an address to the American Institute of Aeronautics and Astronautics quoted in the *New York Times* on February 19, 1967) that supersonic airliners and 450-passenger jets will require radical changes at airports and in surface access to airports. Huge planes will require so much space to maneuver and park that centralized terminals will not be feasible; several terminals must be built at separate locations around the jetport. Mr. Bakke predicted traffic jams will become commonplace on access roads to the airports due to large numbers of passengers moving in and out of the jetport at the same time. He stated that it will be necessary to set up a series of satellite check-in terminals several miles away from the jetport where passengers will be processed, then transported to the passenger terminal at the jetport by bus "or other mass transit vehicle." This day may not be too far off, he indicated, because the jumbo Boeing 747, scheduled for introduction to commercial service by 1970, "will likely force our hand before the supersonic transport comes into the picture." The use of large aircraft should also bring about substantial reductions in the ton-mile costs of handling and transporting air cargo. Reduced costs will enable the airlines to lower freight rates and attract more cargo, thus effecting a large expansion in air freight hauled.

Vertical and Short Take-off and Landing Exercise — Progress achieved in vertical and short take-off and landing (V/STOL) methods point to the fact that they may have substantial impact on aviation in the next few years.

STOL aircraft can easily operate from fields 200 or 250 miles away, so the possibility of using piers or other similar sites as supplemental landing strips for flights from the New York area to Boston, Washington, or Pittsburgh could be a future development that will relieve on-field congestion at the major airports.

Much of the New Jersey waterfront from Weehawken to Bayonne is owned by the railroads. As efforts are made to concentrate railroad activities, land along the Jersey waterfront will become available for other uses. Development of V/STOL sites along this strip might alleviate air traffic problems at Newark Airport.

Summary — Transportation authorities recommend that New Jersey develop an adequate network of general aviation fields to serve business and private aircraft and to reduce the congestion that has developed in the three major airports of the New York metropolitan area. A fourth jetport to serve this area, particularly the northeastern New Jersey region, is called for, but the selection of a suitable site has been a difficult problem. The efficiency of all aviation facilities in New Jersey depends largely on land transportation facilities that serve them. The interface between air and ground transportation at large terminals is causing major concern to airport and highway administrators.

NEW JERSEY HIGHWAY SYSTEMS AND CLASSIFICATION

Chapter 4

The classification of all highways, roads, and streets into systems based on the primary functions which highway facilities serve is the keystone of the determination of highway needs. The assignment of roads and streets into distinct classes, according to the character of service required of each, permits sound engineering and fiscal planning. In this manner, travel demands may be met with adequate facilities commensurate with requirements for safety and economy.

Every user of motor vehicle recognizes that automobiles and trucks are used for an infinite variety of trip purposes, ranging from a very short trip to a neighborhood store to a cross-country trip made by people changing residences or taking advantage of opportunities for vacation travel. It is equally apparent that types of highway and street facilities needed can be correlated to characteristics of trips to be made on those facilities. No measurable benefit can be obtained by constructing high speed, access controlled facilities to serve only trips of short duration, and the added costs for such facilities over those incurred for more conventional roads and streets cannot be justified. However, the benefits to be derived by the traveler utilizing such high speed, multi-lane roads, for trips covering substantial distances, *are* measurable, and adequately justify the additional investment required for their construction.

Throughout the nation, marked changes in travel patterns have occurred. Decentralization of industry, a reduction in agricultural population, and the surging trend toward greater suburbanization, have all had their influence on motor vehicle travel characteristics. Nowhere has this been more evident than in New Jersey. Accentuated by New Jersey's position as a corridor state, and its very high population density, it is not surprising to find that many road and street facilities today carry entirely different types of trips than were the case just a few years ago. The changes that have taken place in trip characteristics have caused many miles of roads and streets to suffer obsolescence, and have created a serious imbalance in jurisdictional responsibilities. Legislators, highway and street administrators, and road users have recognized the need for a comprehensive reclassification of all travelways in accordance with sound principles of functional identification. They have, in addition, recognized the premise that all future highway needs and programs should be based on a stratification of roads and streets into systems according to the predominant trip types, relative trip lengths and traffic volumes found on each increment of the total network.

Since all future estimates of required facilities, and their costs, construction priorities, geometric designs, and proper jurisdictional assignments are fully dependent upon a thorough analysis of the factors mentioned above, functional classification is the first major step toward providing adequate and economically justified facilities for the travel requirements of today and the future and the basis for sound fiscal planning.

Present Classification Systems in New Jersey

Through the history of highway and street development in New Jersey, the pattern of system evolvement has been similar to that found in the remainder of the nation. In order to provide some measure of jurisdictional responsibility for all the highways and streets in the state, many systems of classification have come into use over the years.

The most familiar system in use today in New Jersey is the grouping of highways and streets by administrative designations. This grouping defines the governmental agencies primarily responsible for the improvement and maintenance of specific highways, roads, and streets.

The total network of highway facilities in New Jersey on January 1, 1967, was approximately 33,161 miles. This network was divided into five general administrative groups: the State Highway System, county roads and streets, municipal facilities, toll roads and bridges, and finally forest, park, and institutional roads. Presented in Table 9 are road and street mileages by jurisdictional responsibility as of January 1, 1967. Included for clarity in this table is the category of Federal aid routes assigned to toll and other authorities for jurisdiction.

Superimposed on the administrative systems in New Jersey is the "financing system." These systems have derived from the original source of funds for the construction of the facilities comprising each system, and are listed below:

1. Federal-aid Primary-Interstate
2. Other Federal-aid Primary
3. Federal-aid Secondary
4. Federal-aid Urban
5. Other State Highways
6. County Highways and Streets
7. Municipal Roads and Streets
8. Forest, Park, and Institutional Roads
9. Toll Roads

TABLE 9

HIGHWAY AND STREET MILEAGE
BY ADMINISTRATIVE SYSTEMS

New Jersey

January 1, 1967

SYSTEM	*MILEAGE*	*PER CENT OF TOTAL*
State Highways	1,971.9	5.95
County Roads and Streets	6,739.9	20.33
Municipal Roads and Streets	23,597.3	71.16
Toll Highways	370.3	1.11
Forest, Park, and Institutional Roads	481.2	1.45
TOTAL	33,160.6	100.00

Although most highways and streets were originally assigned to the various systems for sound reasons, a number of problems have been created as the systems evolved. Among the most significant factors contributing to the imbalance of mileages between the several administrative systems has been the very rapid growth of suburban areas in New Jersey. The emergence of new traffic generators, and the greater dependence on automobiles and trucks, have substantially altered travel patterns within the state.

The changing complexion of population concentrations have caused many highway and street facilities to carry trips of greater relative importance and length than they did when originally constructed, while other roads have been downgraded in terms of the predominant character of trips utilizing them.

In addition, the rapid increase in traffic volumes on a significant segment of the total network dictates the need for substantial improvements to many facilities, and the requirement of certain new facilities to provide better service for the altered travel patterns within New Jersey.

It is readily evident to even a casual observer of the problems of present day highway and street administration that there is an immediate and pressing need to reorganize the many administrative systems into integrated systems that will best serve the future needs of the highway traveler.

It is virtually impossible to provide the necessary future planning for the total highway and street network in the absence of a unified system which will permit planners to take into consideration all socioeconomic factors which are such an integral part of long-range planning.

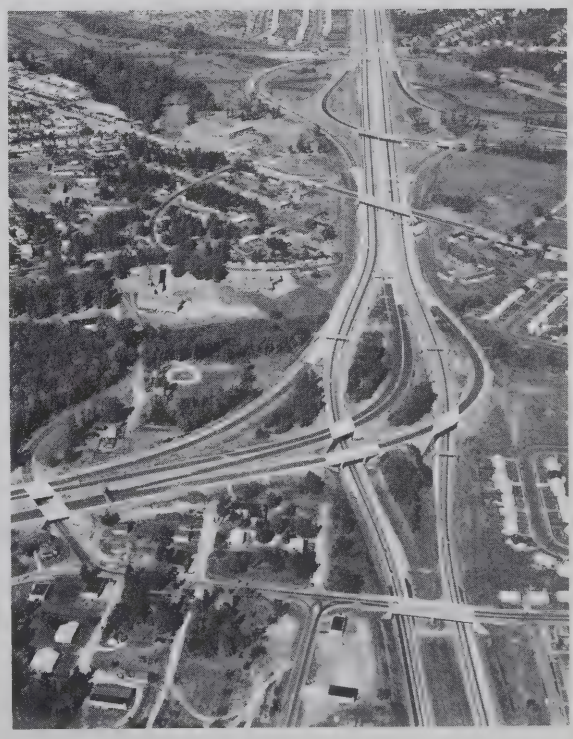
Functional Classification Concepts and Objectives

Functional classification is the assignment of roads and streets to various systems according to the character of service provided by each facility in its relationship to the total network. The analyses which permit proper functional evaluation and assignment take into consideration the probable future role of each road as well as the present service it provides.

The benefits to be derived from organizing roads and streets into logical systems according to their predominant service functions are numerous, but principal among them are the following:

1. More efficient management of the systems is possible, including the programming of available construction and maintenance funds, and the enhanced utilization of technical manpower.
2. System continuity and stability are encouraged, materially aiding long-range planning, with the necessary flexibility to meet changing travel conditions and patterns.
3. Legislators and administrators are given

There are three basic classes of highway facilities — arterials, collectors, and local. Arterials are those highways and streets which principally serve the mobility function. Local facilities primarily provide access to abutting properties. Between these levels of service are collector facilities that collect and distribute traffic to and from arterial and local facilities.



a better opportunity to recognize and meet the most essential needs in the order of their greatest importance, and in the context of the relationship between needs and benefits.

4. The basis is formed for a continuing evaluation and determination of the equitable cost sharing of highway improvements by all beneficiaries.
5. Road facilities are brought together into systems based on the type and extent of demands for travel service that should be under the same jurisdiction.

Basic Functions — Just as motor vehicles are designed to perform specific jobs, the roads they are operated on also perform different functions. These fall into two basic categories: "access" and "mobility." Since every motor vehicle trip begins and ends with the need for egress and ingress to land adjoining the roads at each end of the trip, the roads serving as the terminal facilities for a trip fulfill the function of access. For the same trip, the roads traveled connecting with the trip terminals, or "access" roads, serve the function of "mobility."

Rarely will a single facility serve only the function of access or the function of mobility. Almost all travelways serve as a compromise between the two extremes of service, and functionally classifying any given facility entails a determination of its *predominant* character of trip service. Therefore, functional classification of highways and streets can be defined as grouping these facilities into systems which describe the degree to which each group serves the two basic functions. Those facilities which provide the same character or type of service are classified in the same functional system, and all systems are combined into an integrated network which serves comprehensively the enetire area under consideration.

Terms have been assigned to delineate the predominant function served by any road or street; those that essentially are characterized by the mobility they provide have been termed arterials, while at the opposite end of the scale the facilities which principally serve the function of providing access to abutting property are referred to as access roads and streets. In the mid-range of the functional scale are those routes that serve to collect and distribute traffic between the arterials and access roads; these have been given the term of collectors.

Trip length, operating speed, and need for access to abutting property are interdependent factors. Figure 7 illustrates graphically the interplay between these factors. As average trip length increases, the need for higher operating speeds also increases, while need for access to land adjoining the roadway decreases. Conversely, as the need for access becomes more important, the average trip length on a given facility and the average operating speed on that road segment both decrease. Relatively long average trip length and the need for high operating speeds characterize the arterial facilities, while access roads and streets generally require relatively low operating speeds, and provide for trips of short duration. The compromise between these three factors is typical of collectors.

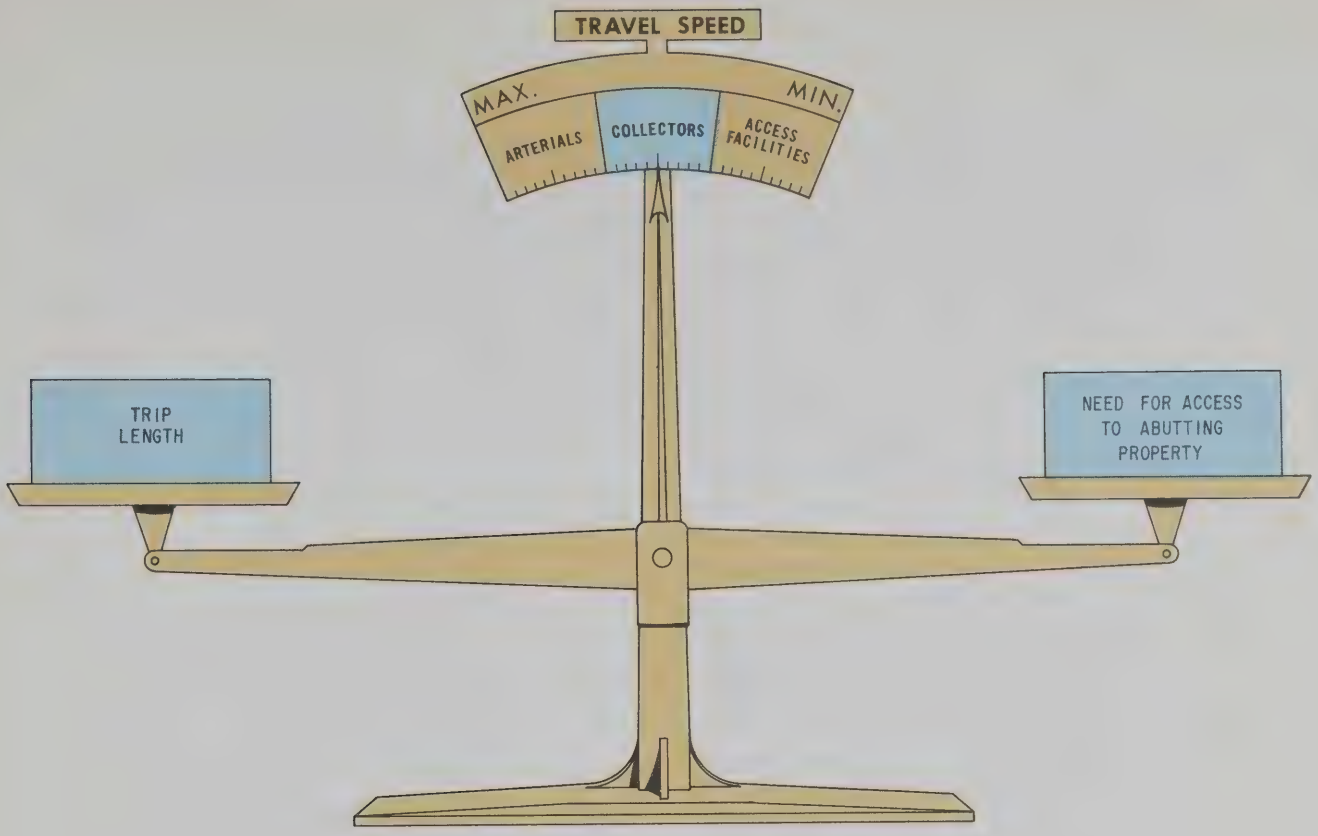
Trip purpose is an important element also in the analysis of all factors influencing the functional classification process. From this factor are derived the probable trip length, preferred operating speed, and the requirement for relative freedom from intersecting traffic and other impediments to freely flowing traffic.

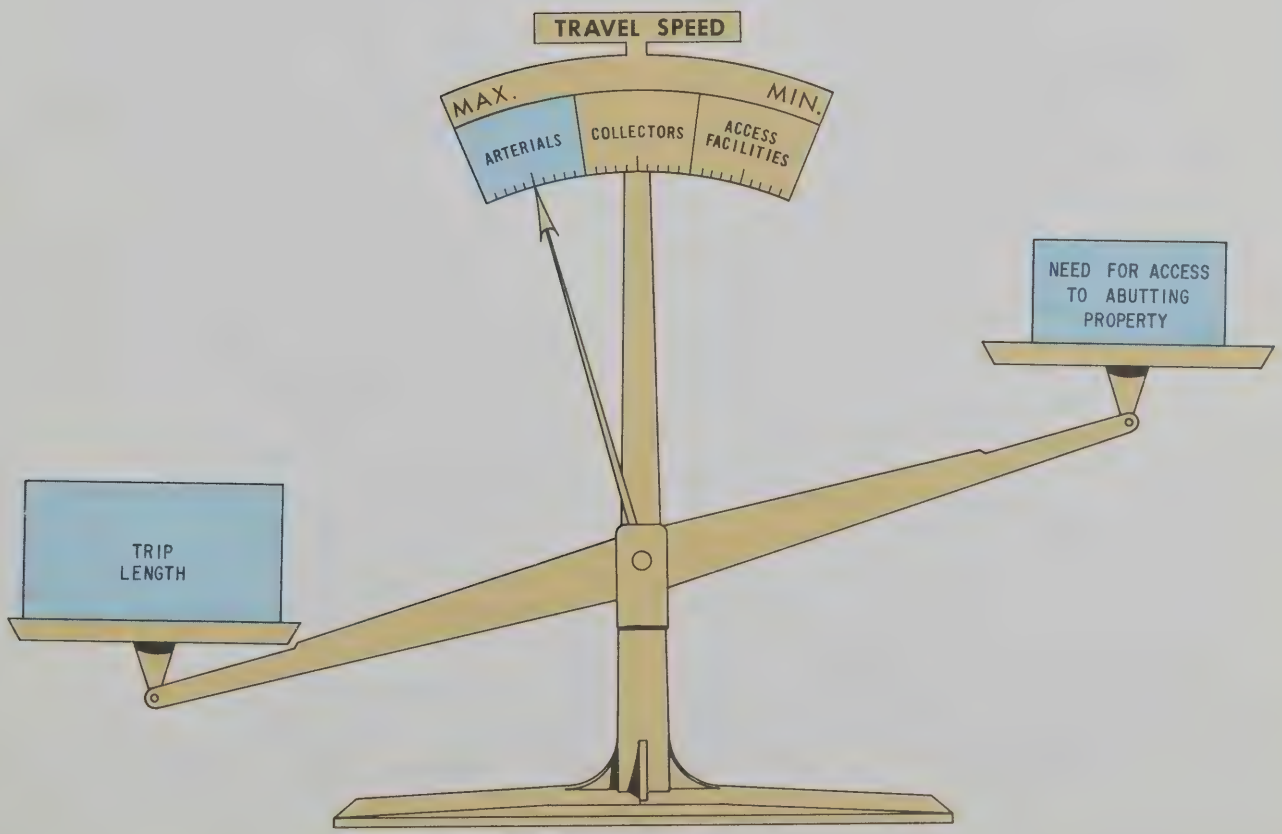
Within the functional scale of arterials, collectors, and access roads, functional systems have been developed for reclassifying all highways, roads, and streets in New Jersey. These systems have been derived to permit subdividing the total network to meet the varying characteristics of total traffic needs, to permit a realistic application of design criteria, and to permit the recognition of unique financing programs.

Following is a listing of the three basic classes within the total scope of functional classification, with the terms and criteria for each subdivision within each class.

A. *Rural Arterial Routes and Their Urban Extensions*

   As a group, the arterial routes are both interstate and intrastate in character.





CONCEPT OF FUNCTIONAL CLASSIFICATION

Serving both rural and urban areas, the distinction in terminology is made to differentiate between the character of each area served, while at the same time retaining the functional identity and system continuity of each route.

1. *Trunk Highways*
   a. Interstate — Those highways which are presently designated as part of the National System of Interstate and Defense Highways.
   b. Class I Major Highways — Principal routes which generally will be constructed to Interstate standards and which will have full control of access. These routes connect principal cities and major population centers and, with the Interstate System, provide freeway service to all parts of the state within approximately 20 miles of all points. The existing toll roads in New Jersey will be included in this system, except for the sections included in the Interstate System.
2. *Class II Major Highways*

   Important routes serving interstate and interregional traffic movements which will require high design speeds. Many of these will have sections with limited access features; together with the Trunk Highways these routes will serve all medium to large centers of population and will provide traffic service to all parts of the state. Spacing of these routes, together with the Trunk Highways, will be such as to permit access to them from any point with only relatively moderate travel distances on facilities of lower classifications.
3. *Area Service Highways*

   All routes of intercounty importance serving relatively moderate traffic movements are constructed to standards based on medium to high design speeds, generally without control of access. These routes, together with the higher classifications, provide service to all county seats and most population centers of 1,000 persons or more. Relatively minor travel distances on lower classed facilities will permit service to any point within the state. The routes to be constructed or improved will vary from relatively high design speeds for multilane divided roadways to medium design speeds for two-lane roadways.

B. *Other Rural Routes*
   1. *Collector Roads*

      Rural roads and their urban extensions in or through smaller communities which form an interconnected network with routes of higher classification and provide service to small communities and other traffic generators and to rural areas within approximately 1 to 3 miles depending on rural population density. Included in the urban grouping of Collectors are those routes which carry high percentages of commuter and other relatively important urban trips through two or more municipalities. The travel demands on these routes require that a distinction be made between Collectors in urban areas and urban arterial streets.

      This category also includes those short routes or spurs which provide service to small communities and other traffic generators so geographically situated that they are not already served by other Collectors or a higher classification of highways.
   2. *Land Access Roads*

      All other rural roads. In general, these roads provide access to farms and land used for other low intensity purposes. Relatively low design speeds will characterize these facilities.

C. *Other Urban Routes*
   1. *Urban Thoroughfares*

      All routes within urban areas serving

major traffic generators and through trip movements.

a. *Primary Thoroughfares* — Streets serving very high traffic volumes and a high proportion of trip lengths of relatively great intra-urban distance. This class generally applies to urban centers of population of moderate to large density and size. They will have design standards incorporating some features of access control and widely spaced at-grade intersections, permitting relatively high urban operating speeds. Usually these are needed in densely populated areas. The Primary Thoroughfares, together with urban extensions of Trunk, Class II Major, Area Service Highways, and Collectors generally form a network on approximately a 1 mile spacing basis.

b. *Secondary Thoroughfares* — Streets serving as traffic collectors feeding into the Primary Thoroughfares and urban extensions of rural arterials. They will also serve traffic generators of intermediate significance such as schools, parks, public buildings, and industrial or commercial areas not already served by higher type facilities.

c. *Commercial Streets* — Access streets carrying little or no through traffic, but usually serving relatively high volumes of traffic making short trips into or within areas where the predominant land use is for retail sales, offices, manufacturing, warehousing, or other commercial and industrial facilities. Streets in this class normally will be constructed to carry heavy vehicles and with provisions for access to parking lots and loading docks. Usually, they will also incorporate such design features as highly developed illumination, storm drainage, and provisions for pedestrian movements.

d. *Residential Streets* — All other streets in urban areas. In general, these streets provide access to land with light to moderately heavy residential development.

The Functional Characteristics of the Existing State Highway System

The functional classification of road facilities which currently comprise the New Jersey State Highway System has revealed that the bulk of the present system is providing relatively high levels of service, and is carrying a significantly large number of long-distance trips. However, it is to be expected that with the changes in travel patterns which have occurred in New Jersey, some facilities are no longer providing to the traveling public the types of service which would justify their retention as a part of the State Highway System.

A number of factors have influenced this; principally the following:

1. Rapidly expanding urban-suburban areas have created major new corridors of travel desires between emerging residential centers and employment locations.
2. New or improved highways have caused a diversion of relatively high density, long-distance trips from older highways with lower service levels.
3. Certain short spurs and urban extensions, originally built as a part of the State Highway System due to construction financing requirements, have never functioned as true arterial routes. The functional classification of all road facilities indicates that several of these roads should more properly be considered as appropriate candidates for inclusion in lower systems.

Mileage by Functional Classification

Table 10 shows the results of functional classification for existing highway, road, and street systems of the state presently under the juris-

TABLE 10

EXISTING FUNCTIONAL CLASSIFICATION AND ADMINISTRATIVE SYSTEMS

New Jersey

January 1, 1967

EXISTING FUNCTIONAL CLASSIFICATION	STATEWIDE SYSTEM			
	State	County	Municipal	Total
Toll Highways	370.3[1]			370.3
Forest, Park, and Institutional Roads	481.2			481.2
Subtotal	851.5			851.5
Rural				
Interstate Highways	43.9[2]			43.9
Class I Major Highways	16.3			16.3
Class II Major Highways	195.8	25.4		221.2
Area Service Highways	522.3	86.5		608.8
Collector Highways	274.7	1,767.0	109.1	2,150.8
Land Access Roads	2.4	2,080.7	9,618.3	11,701.4
Subtotal	1,055.4	3,959.6	9,727.4	14,742.4
Urban				
Interstate Highways	69.9[2]			69.9
Class I Major Highways	50.9			50.9
Class II Major Highways	218.5	3.3	2.6	224.4
Area Service Highways	314.2	29.5	6.5	350.2
Collector Highways	231.6	1,014.7	151.0	1,397.3
Primary Thoroughfares	24.9	260.6	118.9	404.4
Secondary Thoroughfares	5.1	610.3	1,301.0	1,916.4
Commercial Streets		9.0	501.6	510.6
Residential Streets	1.4	852.9	11,788.3	12,642.6
Subtotal	916.5	2,780.3	13,869.9	17,566.7
TOTAL	2,823.4	6,739.9	23,597.3	33,160.6

[1]Included in the total of Toll Highways is the mileage of those facilities which are designated Interstate.

[2]Excludes mileage of "Traveled Way" Interstate and Toll Highways which are designated as portions of the Interstate System.

diction of the New Jersey Department of Transportation and the county and municipal road and street authorities. Also included, but not tabulated by functional classification, are those facilities which are administered by toll, forest, park and institutional authorities and agencies. Also included are the administrative systems to which mileages are presently assigned.

The mileage indicated for the Interstate System (113.6 miles) is the completed portion of the system exclusive of those sections coincident with toll facilities.

There were 67.2 miles of Class I Major Highways including the urban extensions. Class II Major Highways totaled 445.6 miles and Area Service Highways, 959.0 miles. Both figures include urban extensions. There were 3,548.1 miles of Collector Highways, 2,158.0 in rural

areas and the remainder, 1,397.3 miles, in urban. Rural Land Access Roads totaled 11,701.4 miles.

Urban Primary and Secondary Thoroughfares totaled 404.4 and 1,916.4 miles, respectively, while there were 510.6 miles classified as commercial streets, and 12,642.6 of residential streets.

It is evident from examination of mileages within each functional class that responsibility for the same levels of service is scattered among the three administrative jurisdictions.

During the next 20 years there will be changes, some substantial, in the mileage of each highway system. These changes will be brought about by realignment of existing roads, construction of new facilities, abandonment of existing facilities, and the rapidly changing components of New Jersey's rural and urban complex. Shown in Table 11 are the anticipated mileages by functional classification as of the end of the study period, 1986, assuming no transfer of facilities between administrative units.

TABLE 11

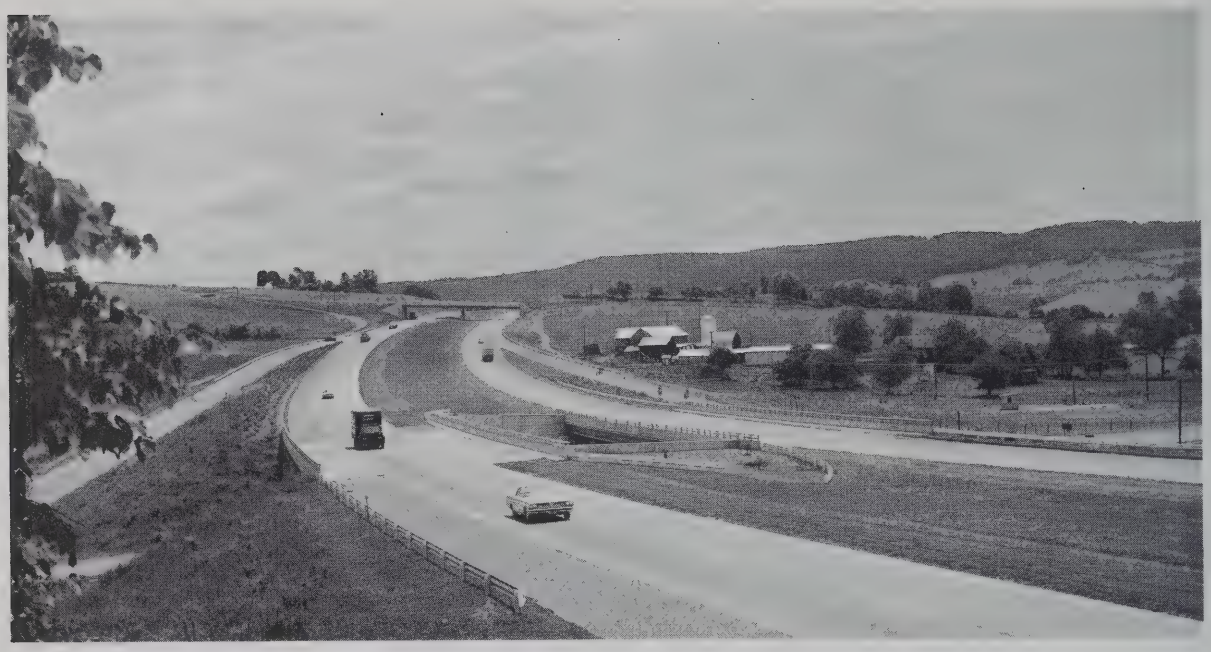
FUTURE FUNCTIONAL CLASSIFICATION AND ADMINISTRATIVE SYSTEMS

New Jersey

1986

FUTURE FUNCTIONAL CLASSIFICATION	*STATEWIDE SYSTEM*			
	State	*County*	*Municipal*	*Total*
Toll Highways	370.3[1]			370.3
Forest, Park, and Institutional Roads	481.2			481.2
Subtotal	851.5			851.5
Rural				
Interstate Highways	145.1			145.1
Class I Major Highways	193.2			193.2
Class II Major Highways	226.0	25.4		251.4
Area Service Highways	457.2	72.2		529.4
Collector Highways	226.7	1,356.1	66.4	1,649.2
Land Access Roads	2.4	1,373.8	6,398.2	7,774.4
Subtotal	1,250.6	2,827.5	6,464.6	10,542.7
Urban				
Interstate Highways	187.4			187.4
Class I Major Highways	330.4			330.4
Class II Major Highways	303.6	3.3	2.6	309.5
Area Service Highways	439.7	43.8	6.5	490.0
Collector Highways	278.8	1,427.7	178.3	1,884.8
Primary Thoroughfares	25.7	260.6	1,109.0	1,395.3
Secondary Thoroughfares	5.1	611.1	1,313.9	1,930.1
Commercial Streets		9.0	501.6	510.6
Residential Streets	1.4	1,559.8	23,081.0	24,642.2
Subtotal	1,572.1	3,915.3	26,192.9	31,680.3
TOTAL	3,674.2	6,742.8	32,657.5	43,074.5

[1]Included in the total of Toll Highways is the mileage of those facilities which are designated Interstate.



New Jersey will be served by a system of Interstate highways totaling 332 miles when complete. In addition, 524 miles of Class I Major Highways and 370 miles of toll highways will provide a total freeway system of 1,226 miles by 1986. These facilities will provide high speed and additional capacity required by the longer trips of New Jersey's growing populace.

It will be noted that total highway, road, and street mileage is expected to increase by almost 9,915.0 miles with a substantial portion of the increase occurring in residential streets. The State Highway System is expected to increase by approximately 850 miles, two thirds of which will be in urban areas. It should be noted that more than 456 miles of the total recommended State Highway System increase will be for new Class I Major facilities, which is indicative of the state's critical need for high-type facilities. Also included in the increased mileage are 218.7 miles of the Interstate System, exclusive of the portions on toll roads.

The total county system of 6,742.8 miles will show practically no change, except for a decided shift of mileage from rural to urban character. The municipal system, as noted earlier, will show an increase of 9,060.2 miles with almost all the growth accounted for by urban streets. Almost 3,263 miles of this system will shift from rural to urban designation, again emphasizing the changing complex of the state's economy.

Recommended Administrative Jurisdictions

As in most states, the responsibility for administering highways, roads, and streets in New Jersey which are not toll facilities or which are not under the direct supervision of forest, park, or institutional agencies is divided between the state, the 21 counties, and the 568 municipalities. Although the basic concept of highway classification is one of functional rather than jurisdictional consideration, one of the most important objectives is to provide a sound basis for the determination of proper governmental units which should be responsible for highways, roads, and streets. The unit selected to administer a particularly functional class should be that with the ability to plan and administer the system most effectively, and that which is most responsive to the public interests correlated to the character of travel service of that system. Because of the criteria used in functionally classifying the total road network in New Jersey, the functional classification procedure lends it-

self readily to the accomplishment of three basic objectives of proper jurisdictional assignment.

First, truly effective highway and street administration would be virtually impossible if roads performing similar types of service were administered by different levels of government. For this reason, an entire functional class should be under the jurisdiction of the same level of government. This avoids parallel or overlapping patterns of responsibility.

Second, jurisdictional assignment should be clear-cut and comprehensive. The ambiguity that results from the use of terms such as "state maintained but not marked," and "designated," and gaps in route jurisdictional responsibility often lead to a lack of cooperation between units of government, and a sharp reduction in administrative efficiency.

Third, jurisdictional assignment should be as stable as possible although future changes in travel patterns may create the need for some transfer of mileages between governmental levels. However, through a continuing functional appraisal process, travel pattern changes would be accompanied by appropriate functional reclassification, and the required transfers in jurisdictional assignment would be automatic.

The ability of any governmental unit to plan and administer a road system effectively is confined generally to its own geographical area. Therefore each unit of government should have under its jurisdiction only those facilities whose impact is limited to that geographical area. A highway of transstate importance properly should be a state responsibility, an intracounty commuter route properly should be assigned to the county level of government, and an arterial street of local importance only would best be administered by the municipality, as this level of government is most intimately familiar with the service such a facility should provide.

Applying these concepts, the recommended assignment of functional classes is presented in Table 12.

All the functional classes recommended for state jurisdiction fall into three categories of travel characteristics: interstate, transstate, and

The predominant use of the bulk of road and street mileage is local and peculiar to the geographical boundaries of the municipalities in which the facility is located. Therefore, these facilities should be the administrative responsibility of the municipality. However, arterial facilities comprising segments of the statewide or countywide system of highways should be administered by the state or county, respectively.

TABLE 12

RECOMMENDED JURISDICTIONAL ASSIGNMENT OF FUNCTIONAL SYSTEMS

New Jersey

1967

FUNCTIONAL SYSTEM	RECOMMENDED GOVERNMENT LEVEL
Rural	
Interstate Highways	State
Class I Major Highways	State
Class II Major Highways	State
Area Service Highways	State
Collector Highways	County
Land Access Roads	Municipality
Urban	
Interstate Highways	State
Class I Major Highways	State
Class II Major Highways	State
Area Service Highways	State
Collector Highways	County
Primary Thoroughfares	Municipality
Secondary Thoroughfares	Municipality
Commercial Streets	Municipality
Residential Access Streets	Municipality

multicounty. The Collector Highways, rural and urban, have been selected primarily on the basis of predominant trip types encompassing two or more municipal areas, and in the densely populated urban areas include many of the sigficantly important rush-hour commuter routes. The arterial streets, included in the two categories of thoroughfares, and the three types of access facilities (rural Land Access Roads and the urban Commercial Streets and Residential Access Streets) are characterized by the principal travel patterns essentially local in nature; hence the municipal recommendation.

The recommended State Highway System for 1986 is depicted in Figure 8. Although all presently existing toll highways are included in the functional network for system continuity, no change in jurisdictional assignment for these facilities is contemplated. Table 13 presents the recommended New Jersey State Highway System mileages by functional class as the routes existed on January 1, 1967, and as they are contemplated for the end of 1986, and again demonstrates the impact of the growing urban complex of the state.

The recommended County and Municipal Systems with their urban and rural mileages are presented in Table 14 by functional class. The

TABLE 13

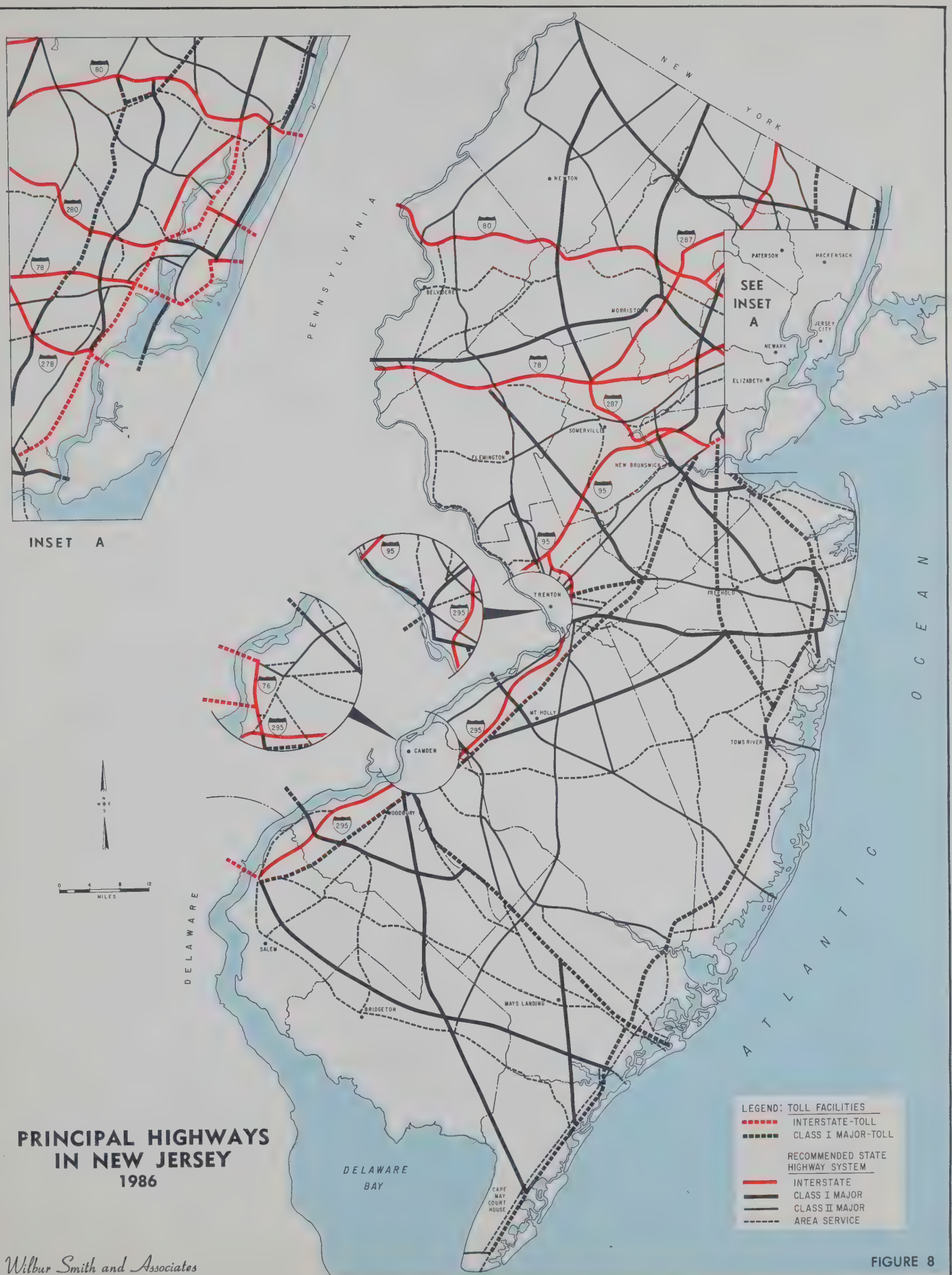
RECOMMENDED STATE HIGHWAY SYSTEM

New Jersey

1967 and 1986

FUNCTIONAL CLASSIFICATION	1967 MILEAGE[1]		1986 MILEAGE[1]	
	Rural	Urban	Rural	Urban
Interstate Highways	43.9	69.9	145.1	187.4
Class I Major Highways	16.3	50.9	193.2	330.4
Class II Major Highways	221.2	224.4	251.4	309.5
Area Service Highways	608.8	350.2	529.4	490.0
Subtotal Rural-Urban	890.2	695.4	1,119.1	1,317.3
TOTAL	1,585.6		2,436.4	

[1]Mileages of toll facilities are excluded.



PRINCIPAL HIGHWAYS IN NEW JERSEY
1986

Wilbur Smith and Associates

FIGURE 8

TABLE 14

RECOMMENDED COUNTY AND MUNICIPAL SYSTEMS

New Jersey

1967 and 1986

FUNCTIONAL CLASSIFICATION	RECOMMENDED SYSTEM	1967 MILEAGE		1986 MILEAGE	
		Rural	Urban	Rural	Urban
Collector Highways	County	2,150.8	1,397.3	1,649.2	1,884.8
Primary Thoroughfares	Municipal		404.4		1,395.3
Secondary Thoroughfares	Municipal		1,916.4		1,930.1
Commercial Streets	Municipal		510.6		510.6
Residential Access Streets	Municipal		12,642.6		24,642.2
Land Access Roads	Municipal	11,701.4		7,774.4	
Subtotal, Rural and Urban		13,852.2	16,871.3	9,423.6	30,363.0
Subtotal, County		2,150.8		1,649.2	
Subtotal, Municipal		28,572.7		38,137.4	
TOTAL		30,723.5		39,786.6	

influence of urban growth expected over the 20-year period from 1967 to 1986 is even further accentuated in the projected mileages for these systems than is the case for the recommended State Highway System. Included in the Municipal System are 990.1 miles of new Primary Thoroughfares and 8,072.6 miles of new Residential Access Streets which will be needed in those areas presently rural which can be expected to become urban or suburban in character by 1986.

Recommended Transfer of Mileage

The degree to which changes in land use, population density, and highway travel patterns have caused an imbalance to occur in mileages assigned to the existing administrative system is borne out in Table 15, which compares the recommended mileages of existing facilities in the state, county, and municipal system, as determined by functional reclassification with the network as it was assigned for jurisdiction on January 1, 1967.

Transfer of mileage to those levels of government best suited to administer the facilities would mean that the State Highway System would transfer to the counties and municipalities a total of 540.1 miles, and that the municipalities would gain 3,813.5 miles presently under county jurisdiction. The municipalities would transfer 260.1 miles now under their jurisdiction to the counties, and 9.1 miles to the state. Table 15 also presents the comparative mileages for the 1986 recommended systems. The net increase in total length of all systems is due to identified routes which should be constructed during the period, and to certain areas which will change from rural to urban in nature during the 20-year period, necessitating substantial construction of additional arterial and residential streets.

Residential Street Development

The substantial increase in residential street mileage caused by future urban development in the state necessitated a special approach in determining the costs associated with such

TABLE 15

RECOMMENDED TRANSFER OF MILEAGE

New Jersey

1967 and 1986

ADMINISTRATIVE AGENCY	RECOMMENDED JURISDICTION	EXISTING JURISDICTION		
		State	County	Municipal
		1967 Mileages		
State	1,585.6	1,431.8	144.7	9.1
Counties	3,548.1	506.3	2,781.7	260.1
Municipalities	27,175.4	33.8	3,813.5	23,328.1
TOTAL	32,309.1	1,971.9	6,739.9	23,597.3
		1986 Mileages		
State	2,436.4	2,282.6	144.7	9.1
Counties	3,534.0	505.5	2,783.8	244.7
Municipalities	36,252.6	34.6	3,814.3	32,403.7
TOTAL	42,223.0	2,822.7	6,742.8	32,657.5

mileage. It was assumed that construction costs of residential streets in new suburban areas would be borne by the real estate developer, and that new facilities, when completed, would be dedicated to the municipalities for maintenance, administration, and future reconstruction. Inasmuch as this anticipated new mileage is of considerable magnitude, local ordinances pertinent to developments should be strengthened so that such streets will be constructed to adequate design standards.

Functional Classification Procedures

The functional reclassification of all existing highways, roads, and streets in New Jersey, and determination of general corridor and area alignments for future facilities by traffic function required compilation and analysis of substantial basic source data. These data included detailed road and street system maps, land-use inventories and projections, road system logs, historical census data and projections, traffic volume and origin-destination data, and aerial photographs. Use was also made of maps and data concerning travel facilities other than highways, and included an examination of rail, water, air, and pipeline facilities and use. Consideration was taken of projected plans for new roads and streets by all administrative levels, and of the inventories, analyses, and projections made by the several urban transportation studies in progress, and the work performed by state, county, and municipal planning agencies.

To apply various processes and procedures necessary in the selection of various functional systems, a number of steps were involved. These steps included a study of regional and state concentrations of urban traffic generators, a determination of principal corridors of interstate and intrastate travel generated by these urban concentrations, an analysis of urban growth and a determination of those areas in New Jersey which can be expected to undergo a transition from rural to urban characteristics within 20 years. In addition, investigations were conducted to determine locations of significant industrial and commercial concentrations, and important recreational areas.

Classification of Class I and Class II Major Highways began with a determination of the principal desire lines of travel between significant traffic generators which would substantially influence travel on these systems. This was accomplished by preparing a regional map with New Jersey approximately in the center, and encompassing the states of Connecticut, New York, Pennsylvania, Delaware, and Maryland. All urban areas with populations in excess of a minimum of 25,000 outside the boundaries of New Jersey and a minimum of 10,000 within New Jersey were identified and located. Overlays of the region were prepared on which all trip attraction lines terminating in New Jersey or crossing the state were plotted. These desire lines were then compared to the existing highway network, and a selection was then made of those facilities which qualified as Class I and Class II Major Highways. Concurrently, corridors of substantial travel not served by adequate facilities were identified to assist in determining general alignments for new facilities in these categories.

Area Service Highways and Collector Highways were selected in a similar manner, utilizing maps and overlays of the State of New Jersey, coordinated with map studies of county and municipal travel patterns, analyses of traffic and origin-destination data, and a study of state, county, and municipal plans for road network improvements. All urban areas were identified and located on the maps, and the functional systems representing current travel characteristics were selected.

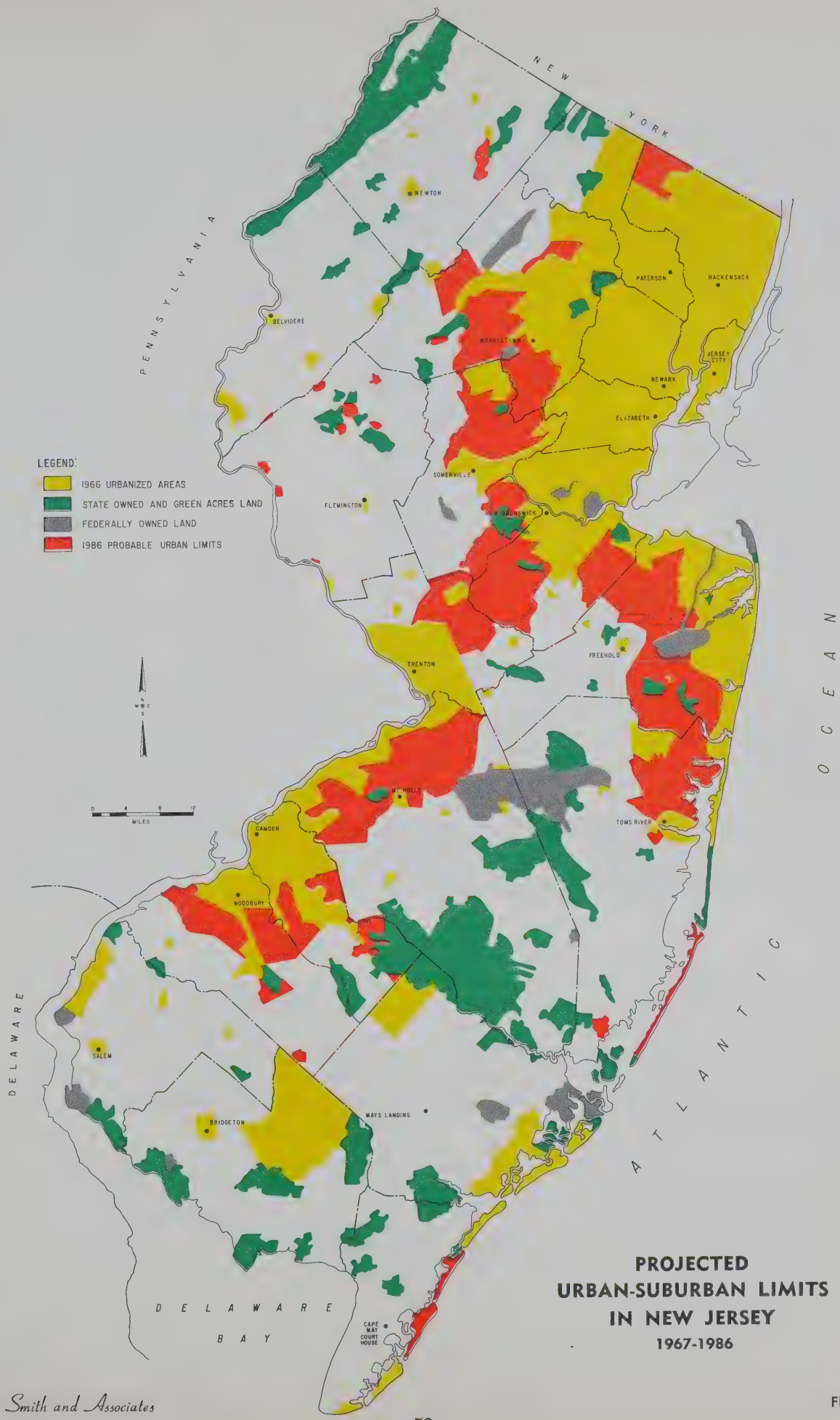
The classification of the urban thoroughfare network and the selection of those street facilities with significant commercial activity were performed utilizing results of the classification process for previously selected facilities, master plans for counties and municipalities, results obtained by planners in the several urban transportation studies in progress, and detailed analyses of land-use maps, aerial photographs and traffic flow data.

After the selection processes described above were completed, the remaining roads in rural areas were identified as Land Access Roads, and the remainder of urban streets were classified as Residential Access Streets.

In selecting the future functions of all facilities in the total road and street network, and to provide base data for the determination of additional facilities needed in the future, a special study was conducted to delineate those areas which would increase in population density sufficiently by 1986 to qualify their treatment as suburban. Census data and land area were compared, and historical population growth trends were examined. Commercial and industrial areas with low resident population were identified. Projections of probable population density were made, and the probable boundaries of suburban growth were defined. A general criterion of 1,000 persons per square mile of land area was used in this selection, but included also were areas with sufficient holding capacity but because of insufficient historical census trends, some adjustments were required. Also included were commercial and industrial areas which properly should be considered within the urban-suburban complex, and officially designated urban areas, proscribed in compliance with federal-aid highway definitions.

Figure 9 depicts the result of this study, and shows the urban-suburban limits at January 1, 1967, and the probable limits at December 31, 1986. The growth in land area which is projected to be urban and suburban in character is shown in Figure 10. It is estimated that the 1,773 square miles in this category in 1967 will increase to 2,759 square miles by 1986. Although a similar pattern of urban sprawl is being demonstrated throughout the Megalopolis corridor, it is believed that the rate of growth in New Jersey is greater than that found in the other states which comprise the balance of the corridor.

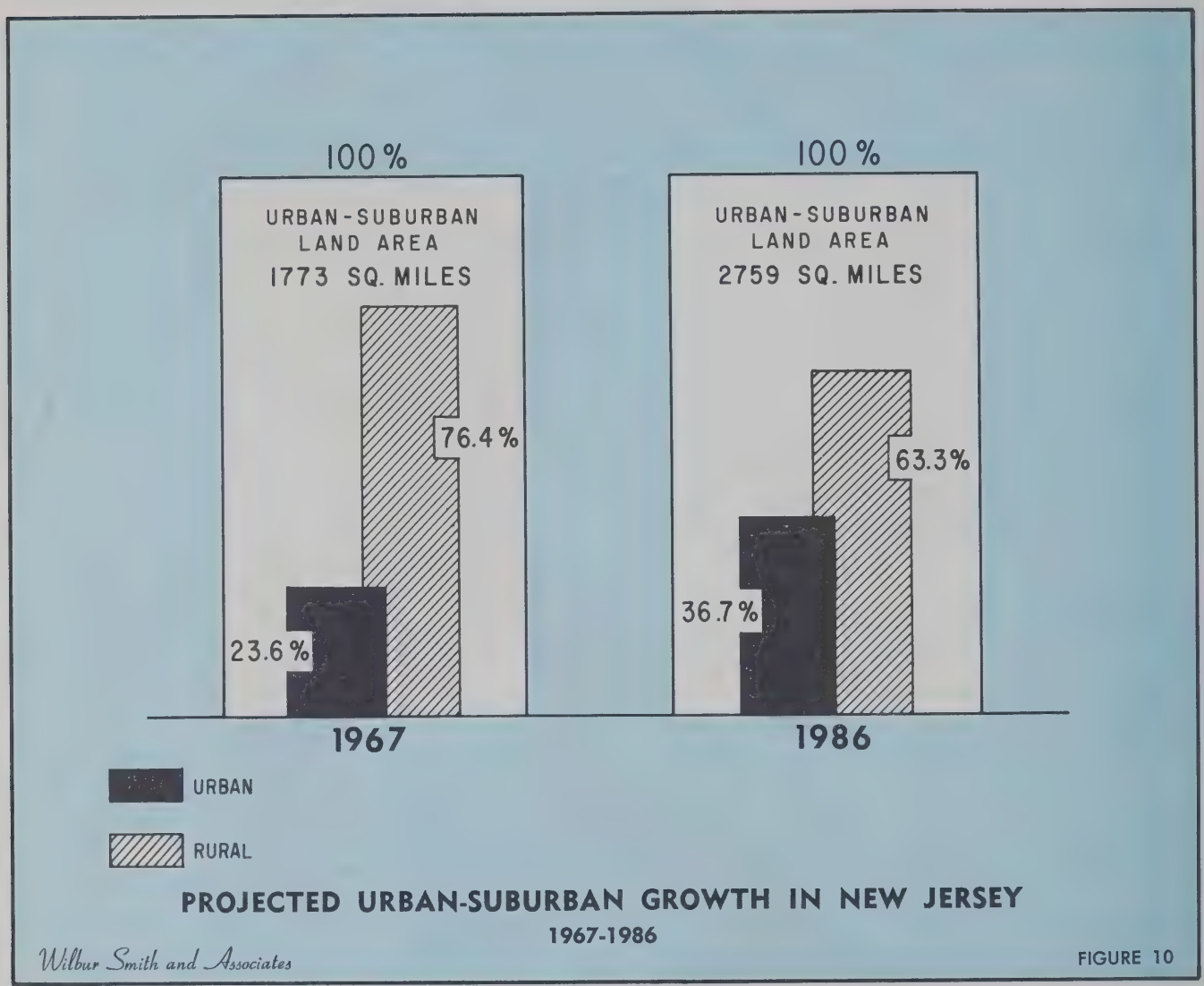
A series of three types of maps was prepared to record the selection of both present and future functional networks. First, the systems of Interstate, Class I and Class II Major Highways, and Area Service Highways were recorded on a map of the State of New Jersey. Where the scale of the map did not permit



PROJECTED URBAN-SUBURBAN LIMITS IN NEW JERSEY
1967-1986

Wilbur Smith and Associates

FIGURE 9



PROJECTED URBAN-SUBURBAN GROWTH IN NEW JERSEY
1967-1986

Wilbur Smith and Associates

FIGURE 10

identifying all routes in these classifications, urban area maps to a larger scale were utilized. The second series of maps was countywide, and was utilized to show in greater detail all routes shown on the state map. In addition, the selection of all Collector Highways and Land Access Roads was recorded, as well as the present and future urban limits. The third series of maps included aerial photographs and municipal street maps. The urban extensions of all previously selected routes were displayed, and the selected thoroughfare network, Commercial Streets, and Residential Access Streets were identified.

HIGHWAY, ROAD AND STREET NEEDS

Chapter 5

Sound improvement programming and fiscal planning must be based on a determination of financial requirements for construction, maintenance, and administration of the highway system for some predetermined future time period. The purpose of the New Jersey Comprehensive Highway Needs and Fiscal Study is the determination of these data, and the development of recommended fiscal programs which will permit the improvement of the highway system to acceptable standards.

This study includes an evaluation of all highways, roads, and streets in New Jersey under state, county, and municipal jurisdiction, a total of over 32,000 miles. The needs estimate covers from January 1, 1967, through December 31, 1986. The total needs estimate is the sum of all the expenditures which normally can be expected to occur in the construction, maintenance, and administration of the several highway systems.

Study Procedures for Principal Facilities

A detailed manual covering procedures to be followed in the appraisal of needs on New Jersey's principal roads and streets was prepared to guide engineers so that uniform analyses were accorded all facilities. Detailed instructions on methods of evaluation and use of project worksheets employed to record existing conditions and necessary improvements were contained in the needs appraisal manual.[1]

Maps showing functional classification were furnished field appraisal crews, who inventoried and evaluated the existing conditions on all roads and streets classified as other than land access roads, commercial streets, or residential streets. Each mile of road and street (except on the three classes of access facilities) was individually appraised and evaluated in line with instructions contained in the needs appraisal manual. In addition, detailed information was obtained on every railroad grade crossing and structure located on these principal facilities.

Upon completion of the field appraisal process, all roadway section, bridge, and railroad grade crossing work sheets were examined to determine present and future deficiencies. In order to determine deficiencies, minimum acceptable or tolerable conditions standards were developed by the study staff and reviewed by the New Jersey Department of Transportation, Division of Planning, and the U. S. Department of Transportation, Bureau of Public Roads.

Tolerable conditions for urban and rural areas

[1] *Highway Needs Appraisal Procedures*, Wilbur Smith and Associates, August, 1966.

A major item in the determination of roadway adequacy is surface width. Determination of tolerable surface widths were based on requirements for traffic capacity and for traffic safety. Tolerable widths vary with a route's functional classification and traffic volume.

are shown in Appendix Tables 1 and 2. These tolerable conditions were used to determine if each roadway section met the minimum standard of highway conditions which a motorist should be expected to accept. In the appraisal process, each highway and street section was compared with these minimum acceptable conditions to determine the nature of its deficiency, if any; the mileage of deficient highway, and the backlog of needs. Those roads which were not structurally or functionally deficient at present were analyzed to determine whether or not they would become deficient during the 20-year study period. The reasons for any future deficiencies were indicated, and the cost and probable time period of needed improvement were determined.

Standards for improvements were developed and reviewed by the New Jersey Department of Transportation and the U. S. Department of Transportation. These standards were utilized to determine the extent of improvements necessary to overcome existing and future deficiencies. Urban and rural design standards are contained in Appendix Tables 3 and 4. Improvements were determined for travel requirements of each route for 20 years from the date of needed improvement. Cost of such improvements were estimated, based on current unit costs for various construction items. Where practical considerations negated the possibility of complete compliance with the design standards, adjustments were made in geometric requirements to permit cost analyses commensurate with realistic design limitations.

Construction Needs — Construction needs are made up of three major elements: Identified, stopgap, and replacement.

1. Identified Construction Needs — This item includes the cost of improvement of presently deficient sections and also the cost of improvement of those sections which will become deficient in the predictable future, considered to be within the 20-year study period. Future deficiencies have been estimated, based on predictable structural obsolescence resulting from pavement or bridge deterioration, or from functional obsolescence caused by increased traffic volumes and traffic demands. Identified construction needs were developed by estimating the cost of improving deficient facilities to design standards for traffic volumes 20 years from the time of improvement.

Construction or improvement cost estimates were determined for the following six major cost categories:

(a) right-of-way
(b) grading and drainage
(c) base and surface
(d) miscellaneous
(e) structures
(f) railroad crossing protection

Other cost items such as design and construction engineering were included with the appropriate major cost item.

2. Stopgap Construction Needs — In any highway improvement program, it is always necessary to defer some projects until they can be programmed and funds become available. While these projects are deferred, they will require certain amounts of minor betterments or extraordinary maintenance in order to remain in a serviceable condition until the identified construction needs can be met. Extraordinary maintenance programs, such as resurfacing, expedient traffic control installations, minor repair of structures, etc., will be necessary in the time period involved in overcoming these existing deficiencies (often called the catch-up period) before the facility can be brought up to design standards. Costs of this work are known as stopgap needs.

Stopgap construction needs were not determined for individual projects, but instead were determined to be a function of the magnitude of backlog needs and the limitations on the size of the highway construction program. These needs are based on the cost of the deferred construction and the average time that the needed projects are deferred.

3. Replacement Construction Needs — Generally, the average life of many pavements after initial improvement to appropriate design standards will be sufficient to permit their use without further improvement during the study period. However, extensive studies of road life have shown that there still will be some portion of newly improved highways which will require further improvement within the period. These studies have indicated that very small portions of new construction will fail shortly after construction, and that the rate of failure will increase as the average life of the roadway element is approached. Replacement needs therefore represent "second generation" improvement during the study period after identified needs have been satisfied.

Replacement construction costs are based on a statistical relationship between average life expectancy and the frequency of retirements. On the basis of these data, retirement frequency rates are applied to new construction mileages to determined the proportion which will require some major attention within the 20 years under consideraton. Replacement needs vary with the time and rate of construction and cannot be directly related to any particular section of road. Replacement costs include those of future resurfacing or reconstruction of those sections of road improved during the study period which meet design standards at the time replacement costs are applicable.

Maintenance and Administration — Maintenance costs for highway systems are second only to the cost of construction needs. Mainte-

Maintenance costs represent those expenditures required for normal repair and operation of the highway plant and in terms of magnitude are second only to the cost of construction needs. A major item included with maintenance needs is the cost of snow and ice removal and control. Other major items are maintenance and repair of structural elements and operational costs such as roadside maintenance, electric lighting, and traffic signal operation.

nance represents those expenditures required for normal repair and operation of the highway plant. Maintenance costs include allowances for preventive maintenance and repair of structural elements of the roadway, including wearing surfaces, shoulders, ditches, structures, culverts, and other drainage facilities. Operation costs include cutting and clearing vegetation, snow and ice removal and control, debris removal, roadside planting and other erosion control maintenance, upkeep of guard rails and fences, drainage pumping, electric lighting, and operational costs of traffic signals. Maintenance costs are developed by multiplying unit maintenance costs by the miles of highways and streets in each of several categories, based on functional classification, surface type, and number of lanes. Estimates of maintenance needs take into account changes in mileage in each of these categories brought about by improvement of facilities to appropriate design standards. In addition, maintenance needs vary with the rate at which the backlog of existing deficiencies are reduced.

Administrative needs include those costs that cannot be directly related to either the construction or the maintenance of the various highway agencies. They include the salaries of top management personnel, accounting and legal operations, highway planning and research, and general office expenses. Estimates of administrative needs are based on the proportion of total highway expenditures which normally have been used for administrative activities and which are directly proportional to the magnitude of the construction and maintenance program.

Study Procedures for Local Access Facilities

The bulk of the mileage in the state consists of local access facilities (including Land Access Roads, Commercial Streets, and Residential Streets) which represent almost 77 per cent of the total highway, road, and street mileage in New Jersey. Individual appraisal of conditions and needs on each of these facilities is neither necessary nor practical. Extensive road life and investment analyses have indicated that needs on these classes of facilities can be very accurately determined by an average annual cost concept. Road life studies have shown that over an extended period, average annual costs for such facilities will remain relatively constant for the entire group. Accordingly, needs for these facilities have been estimated in this study by a mass analysis procedure.

Needs for local access facility classifications were established in two categories: those presently deficient in some form and those which are adequate now, but which will become deficient at some point within the study period. To identify this separation, an inventory of local road mileage maintained by the counties and municipalities was performed on a statistical sampling basis. Local access mileage on the state system was appraised in accord with procedures used on other functional classes. Mass analysis data were developed for all 21 counties and for typical rural, suburban, and urban areas within each county. Detailed field surveys were conducted on a random sample representing 9 per cent of the total mileage of local access streets and roads. Observations of field conditions on the sample were related to the total statewide mileage of access facilities.

Following the assignment of each mile of road and street in either an adequate or inadequate category, the mileage was multiplied by the annual cost per mile for grading and drainage, base and surface, and structure construction. In the case of adequate facilities, the annual construction cost was nominal and could be considered in the same category as the replacement construction needs which were included in other needs program calculations. The assigned annual cost per mile for the inadequate mileage included the cost of initial construction to adequate standards averaged over the period, with a small added increment for replacement construction during the 20 years.

To permit comparison with appropriate tolerable conditions and design standards tables, tabulations were prepared for local access roads and streets that showed the mileage in each of several categories, determined by type of surface, width of surface, and traffic volumes. Roads of inadequate width or inadequate surface type, as determined by comparison with tolerable conditions, were classified as deficient.

The remaining mileage was assigned to the tolerable category.

Annual maintenance requirements were developed for each of these local access facility categories by applying typical costs per mile for different surface types to the mileage of roadway in the appropriate categories. These maintenance costs were sufficient to provide adequate maintenance for all sections, and, in the case of earth and gravel surfaced roads, the maintenance costs included the replacement of gravel and the regrading of the roads at intervals to permit the retention of adequate surface conditions.

Administrative costs were estimated, based on their percentage of the total improvement program.

Program Period

Highway needs elements have been assembled into programs which show projected total annual cost by highway system. Programs are normally developed for various assumptions based on the rate of attainment of adequacy or elimination of the backlog of deferred construction. Backlog needs include the portion of identified construction needs for projects on presently deficient sections of roadway. Future needs include the remaining identified construction on roads which will become deficient during future years, as well as stopgap and replacement construction, maintenance, and administration. The magnitude of improvement program is changed drastically after completion of construction scheduled during the catch-up period, particularly under the condition of large backlog needs and a short catch-up period. Program costs are based on the assumption that, at the completion of the catch-up period, all highways will be at least equal to tolerable condition criteria established for the study.

Total program costs for alternative program periods have been developed for each functional classification of highway. These programs show the average annual cost for overcoming backlog deficiencies during a catch-up period, and the cost of retaining adequacy during the remaining years of the study period. For local access roads and streets included in the mass analysis, only 20-year programs have been developed.

State Highways

As of January 1, 1967, highways under the jurisdiction of the New Jersey Department of Transportation totaled 1,971.9 miles. Of this, 1,055.4 miles were in rural areas and 916.5 miles were in areas that were urban and suburban in character. More than 40 per cent of the State Highway System was functionally classified as Area Service Highways while an additional 21 per cent were classified as Class II Major Highways. In addition, 3.4 per cent were classified

Roadway alignment was one of the items evaluated in the appraisal of needs as was structure width. Alignment is the major design element affecting operational characteristics of a facility and is, therefore, primarily related to functional classification or level of service. Structure width is a major item in the evaluation of highway safety because of the hazards imposed by narrow clearances to bridge abutments.

as Class I Major Highways, and the Interstate Highways presently in existence and under the jurisdiction of the New Jersey Department of Transportation accounted for almost 5.8 per cent of the State Highway System.

By 1986, the completion of the Interstate highway program and the construction of additional facilities under the State Highway System will result in a significant diversion of traffic from several of the existing state highways to these newer and greatly improved facilities. Other highways in the system will continue to carry substantial traffic volumes, but trip characteristics of those facilities indicate that they more properly serve county and municipal functions. Construction of new mileage and improvement of existing mileage based on future use have been assumed in determining the total increase of 850.8 miles of state highways. In the following sections, the present condition of the State Highway System is reported and the cost to improve present highways and to construct new and greatly needed facilities during the next 20 years are included.

Present Conditions — The State Highway System totaled 1,858.1 miles on January 1, 1967, exclusive of the 113.8 miles which were completed to full Interstate standards. As shown in Table 5-1, a total of 655.9 miles had existing deficiencies which require immediate correction to bring them to acceptable standards. This presently deficient mileage amounts to 35.3 per cent of the present State Highway System, exclusive of the Interstate mileage built to final standards.

While it is generally accepted that the heavily traveled state highway should have high-type pavement, it is more important to consider the condition of the pavement. In view of the very high traffic volumes to which the State Highway System has been subjected for many years, it would be expected that a significant segment of the State Highway System would be found deficient in pavement condition. However, the field appraisal revealed only a relatively minor mileage with pavement deficiencies; this condition reflects a commendable highway policy which insists upon high design standards for pavements and an effective maintenance program. As shown in Table 16, only 11.4 miles were found to be presently deficient in surface condition, and only 0.8 miles were found to be deficient in both surface condition and width.

Of equal status in the determination of roadway adequacy is the element of surface width. At present, 603.3 miles of the State Highway System are deficient in surface width. This accounts for almost 92 per cent of all existing deficiencies and for more than 32 per cent of the total State Highway System. This critical deficiency is a result of the rapidly expanding travel demands on the State Highway System, a trend that has grown in magnitude for many years. In analyses of present and future travel demands, the effect of traffic diversion to new routes which are urgently needed has been taken into consideration; without the new routes the impact on the present system by traffic of today and the future would create a much greater total mileage of insufficient pavement width.

The next significant element of existing deficiencies within this system is that of shoulder width. Slightly over 2 per cent of the present State Highway System (less existing Interstate Highways) was found to have shoulder widths less than acceptable. The 38.8 miles found to be deficient in this element constitute slightly less than 6 per cent of the total currently deficient state highway mileage. However, some additional mileage was deficient in shoulder width but was also deficient in surface condition and surface width. This mileage was included in the major deficiency category rather than listed with sections having only shoulder width deficiencies.

An additional element of major significance in highway needs analyses is that of acceptable roadway alignment. It is noteworthy that no single section of highway under state jurisdiction was found to be deficient solely for the reason of intolerable alignment, and only 1.6 miles were found to be deficient in both shoulder width and alignment. The absence of a significant mileage of alignment deficiencies is indicative of sound design practices long employed by the state.

TABLE 16

MILEAGE OF EXISTING MAJOR DEFICIENCIES ON STATE HIGHWAYS

New Jersey

1967

FUNCTIONAL CLASSIFICATION	*SURFACE CONDITION*	*SURFACE WIDTH*	*SURFACE CONDITION AND WIDTH*	*SHOULDER WIDTH*	*ALIGNMENT*	*SHOULDER WIDTH AND ALIGNMENT*	*TOTAL*
Class I Major	—	29.1	—	1.7	—	—	30.8
Class II Major	0.5	207.2	—	9.1	—	—	216.8
Area Service	2.6	217.8	0.1	15.5	—	—	236.0
Collector	6.2	144.9	0.7	12.5	—	1.6	165.9
Land Access	1.9	—	—	—	—	—	1.9
Primary Thoroughfare	—	3.2	—	—	—	—	3.2
Secondary Thoroughfare	.2	1.1	—	—	—	—	1.3
TOTAL	11.4	603.3	0.8	38.8	—	1.6	655.9

NOTE: Mileage with shoulder width or alignment deficiencies which also have surface width or condition deficiencies were included in the latter categories.

However, although the combined deficiencies of shoulder width and alignment account for less than one tenth of 1 per cent of the State Highway System, they do represent safety hazards which require immediate attention.

Roadways with major deficiencies were assigned to the backlog, or "needed now," category because of the urgency of needed construction. These projects represent those needs which should have been satisfied at an earlier time, but were not corrected because of lack of funds. Slightly more than 35 per cent (655.9 miles) of the present State Highway System (exclusive of the Interstate System) were found to be deficient in some aspects. However, only 638.5 miles were included in the backlog since some deficiencies were not considered to be critical. Also, the timing of improvements for an entire project or other considerations is not conceivable after the time period of improvement for specific route sections, thereby accounting for the difference in deficient mileage and backlog mileage.

Identified Construction Needs — Identified construction needs for state highways have been developed for existing deficiencies and projected future deficiencies based on design standards for each functional class of highway, and on estimated traffic volumes 20 years from the time of improvement. A total of $3,115,212,000 of identified construction needs has been estimated for state highways in the next 20 years, exclusive of the needs for the Interstate System. Because of the unique financing program for Interstate Highways, they have been excluded from this tabulation and are covered in a succeeding section of this chapter.

More than 55 per cent of the identified construction needs on the State Highway System is required for Class I Major Highways, facilities which will provide "freeway" service, and which will be built to design standards similar to those employed on the Interstate System. As can be seen in Table 17, approximately one third of these needs are backlog requirements, and almost all these facilities are required within the first 15 years. This emphasizes the urgent need for high speed, access controlled facilities to assist in handling the rapidly increasing travel demands in New Jersey.

Class II Major Highway construction needs amount to slightly more than 25 per cent of the total identified needs on the State Highway System, while Area Service Highways will require an expenditure equal to almost 14 per cent of the total State Highway System needs.

Collector Highways, Land Access Roads, Primary and Secondary Thoroughfares construction needs total less than 6 per cent. It is these latter facilities which are recommended for transfer to the county and municipal jurisdictions.

Almost 44 per cent of the total identified needs will be required to overcome existing backlog deficiencies. These needs total $1,362,631,000 as shown in Figure 11. An additional $463,842,000 will be required by 1971, representing almost 15 per cent of the total identified construction needs on the State Highway System. The 5 years between 1972 and 1976 will require $515,262,000 or approximately 16.5 per cent of the total State Highway System identified construction needs. The two time periods from 1977 to 1986 will have lesser amounts of identified needs, amounting to $441,040,000 and $332,437,000, respectively.

The distribution of identified construction needs according to type of construction cost item is shown in Table 18. The largest cost item, structures, will require $850,311,000 or 27 per cent of the total identified construction needs. Grading and drainage, the second most costly item, totals $690,098,000, or 22 per cent of the total identifieid construction needs. Right-of-way acquisition will require $646,862,000, representing almost 21 per cent of the identified construction needs, while base and surface needs of $629,350,000 is equal to 20 per cent of the needs. Miscellaneous costs and railroad grade crossings needs of $289,965,000 and $8,626,000, respectively, account for an additional 10 per cent of the total identified construction needs on the State Highway System.

The bulk of right-of-way needs is required for Class I Major Highways, which generally will be built on new alignments. The balance of right-of-way requirements is occasioned by

TABLE 17

IDENTIFIED CONSTRUCTION NEEDS BY TIME PERIOD

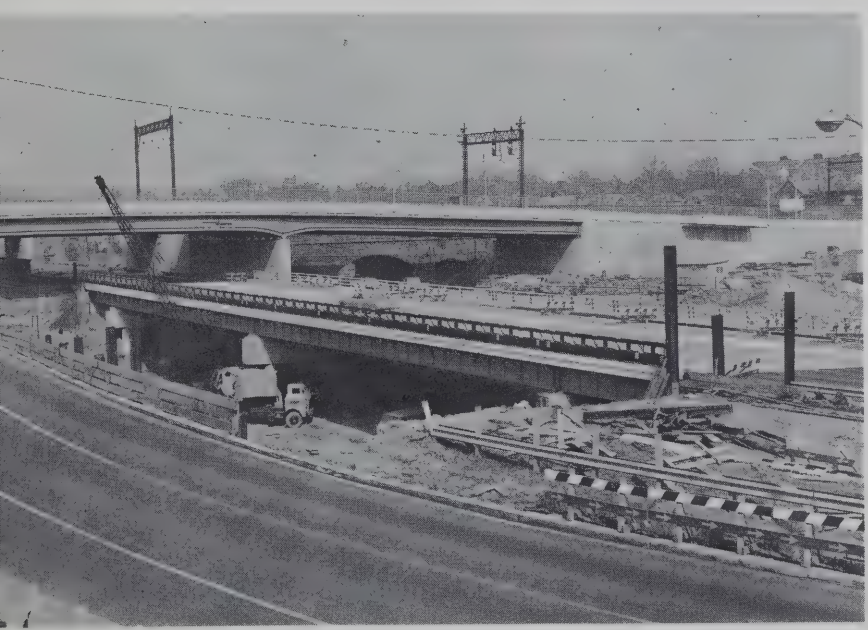
State Highway System

New Jersey

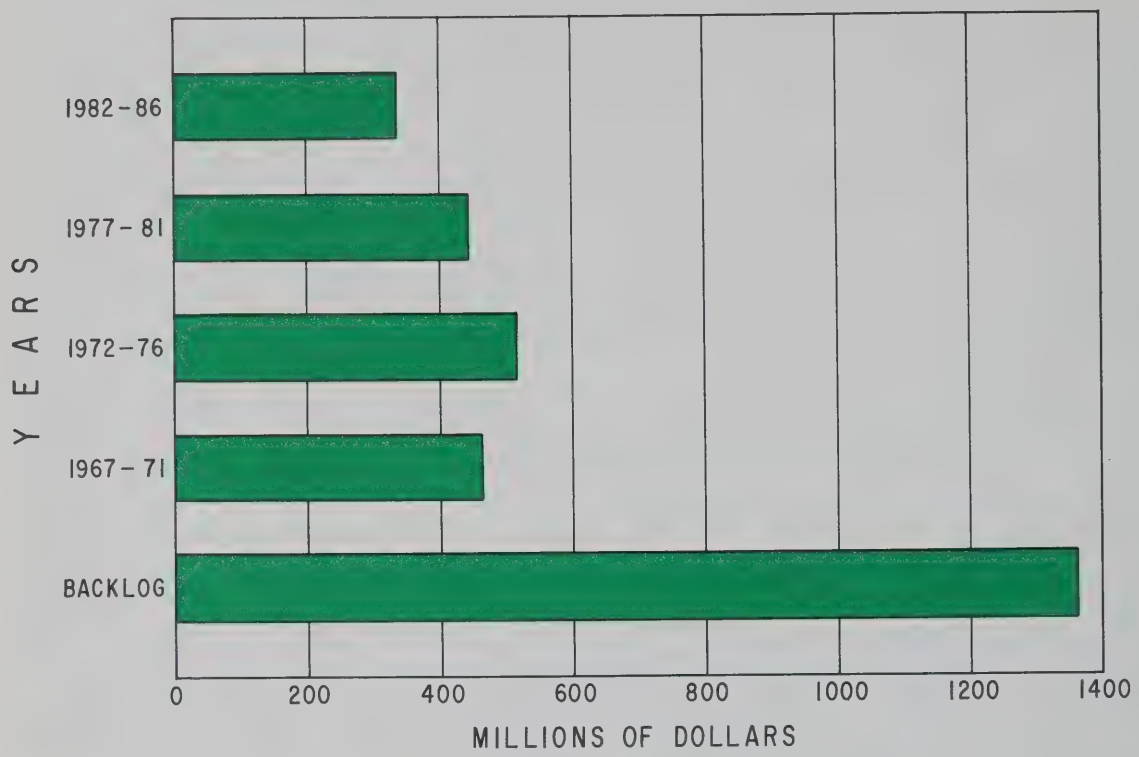
1967-1986

FUNCTIONAL CLASSIFICATION[1]	*BACKLOG*	*1967-1971*	*1972-1976*	*1977-1981*	*1982-1986*	*TOTAL*
			(thousands)			
Class I Major	$ 561,428	$392,288	$287,193	$295,485	$182,060	$1,718,454
Class II Major	475,521	36,697	122,548	86,638	60,166	781,570
Area Service	210,257	28,302	77,479	44,697	74,013	434,748
Collector	109,043	5,495	24,337	12,364	12,433	163,672
Land Access	331	—	—	—	—	331
Primary Thoroughfare	3,995	1,060	3,642	1,726	3,621	14,044
Secondary Thoroughfare	2,056	—	63	130	144	2,393
TOTAL	$1,362,631	$463,842	$515,262	$441,040	$332,437	$3,115,212

[1]Does not include Interstate System Needs.



Over $850,000,000 will be required in the next 20 years for structures on the state highway system, exclusive of the Interstate System. This is the largest single cost category included in the total identified construction needs of over $3,100,000,000. Other major items are grade and drain, right-of-way, and base and surface costs. Additional construction costs will be incurred for stopgap and replacement needs.



IDENTIFIED CONSTRUCTION NEEDS BY TIME PERIODS

STATE HIGHWAYS

NEW JERSEY

Wilbur Smith and Associates

FIGURE 11

the need for widening substantial mileages of the existing State Highway System.

Interstate Highway Needs — The National System of Interstate and Defense Highways is scheduled for completion during 1975. New Jersey's part of this system will be financed, insofar as initial construction is concerned, by 90 per cent federal-aid funds, with the remainder coming from state sources. Estimates of the needs to complete the Interstate System were prepared by the New Jersey Department of Transportation in accordance with Section 104(b) (5), Title 23, U. S. Code of Highways. This estimate is required by the Congress on a biennial basis. The latest estimate was for 1967, and was prepared to reflect the estimate of cost remaining as of January 1, 1967. The cost of completing the toll-free portion of the system is $814,717,000, with the state's share totaling $81,471,700.[2] During this period, the state will also incur additional needs for limited

[2]Costs are as submitted to the U. S. Department of Transportation, Bureau of Public Roads and do not reflect the adjustments made by the Bureau.

TABLE 18

IDENTIFIED CONSTRUCTION NEEDS BY COST ITEM

State Highway System

New Jersey

1967-1986

FUNCITIONAL CLASSIFICATION[1]	RIGHT-OF-WAY	GRADE AND DRAIN	BASE AND SURFACE	MISCEL-LANEOUS	RAILROAD CROSSINGS	STRUCTURES	TOTAL
			(thousands)				
Class I Major	$353,908	$438,294	$270,423	$163,106	$ 125	$492,598	$1,718,454
Class II Major	162,452	138,758	154,623	72,221	3,315	250,201	781,570
Area Service	94,642	76,116	141,678	37,150	3,289	81,873	434,748
Collector	30,620	34,268	58,908	15,822	1,592	22,462	163,672
Land Access	—	54	137	8	—	132	331
Primary Thoroughfare	5,169	2,483	3,189	1,600	245	1,358	14,044
Secondary Thoroughfare	71	125	392	58	60	1,687	2,393
TOTAL	$646,862	$690,098	$629,350	$289,965	$3,626	$850,311	$3,115,212

[1]Does not include Interstate System.

replacement construction and for maintenance and administration. These items have been estimated at $137,860,000. Total Interstate needs during the 10-year period, 1967-1976, average $95,257,700 annually, with $73,324,600 from federal-aid funds and $21,933,100 from state funds.

During the subsequent 10-year period, 1977-1986, replacement construction and maintenance requirements will increase and the average annual need will total $8,690,500. It is assumed, based on present policies, that these requirements will be met by state sources. The Interstate program is summarized in Table 19 in terms of average annual needs for the two 10-year periods.

In the compilation of state highway needs programs, that portion of Interstate System needs to be financed by federal funds has been excluded. In the 15 and 20-year programs, Interstate needs are included as averages of annual needs shown in Table 19, rather than assuming an extension of the Interstate program period beyond 1975.

Needs Programs — Average annual program costs, which include backlog construction, future construction, maintenance, and administrative needs, have been calculated, assuming 10, 15, and 20-year periods for attainment of adequacy or catchup on all state highways. Results of these calculations are presented in terms of average annual financial requirements for conducting the programs during and after the catch-up periods.

Total programs for the State Highway System are shown in Figure 12. The needs program, outlined in greater detail in Table 20, ranges from $311,217,000, annually for the 10-year catch-up period to $225,820,400, annually during a 20-year catchup period. An intermediate program of 15 years would require $257,382,200, annually. Average annual program costs after catchup are $136,549,100 for the remaining 10 years after the 10-year program and $128,682,200 for the 5 years after a 15-year program.

The rural and urban division of needs for

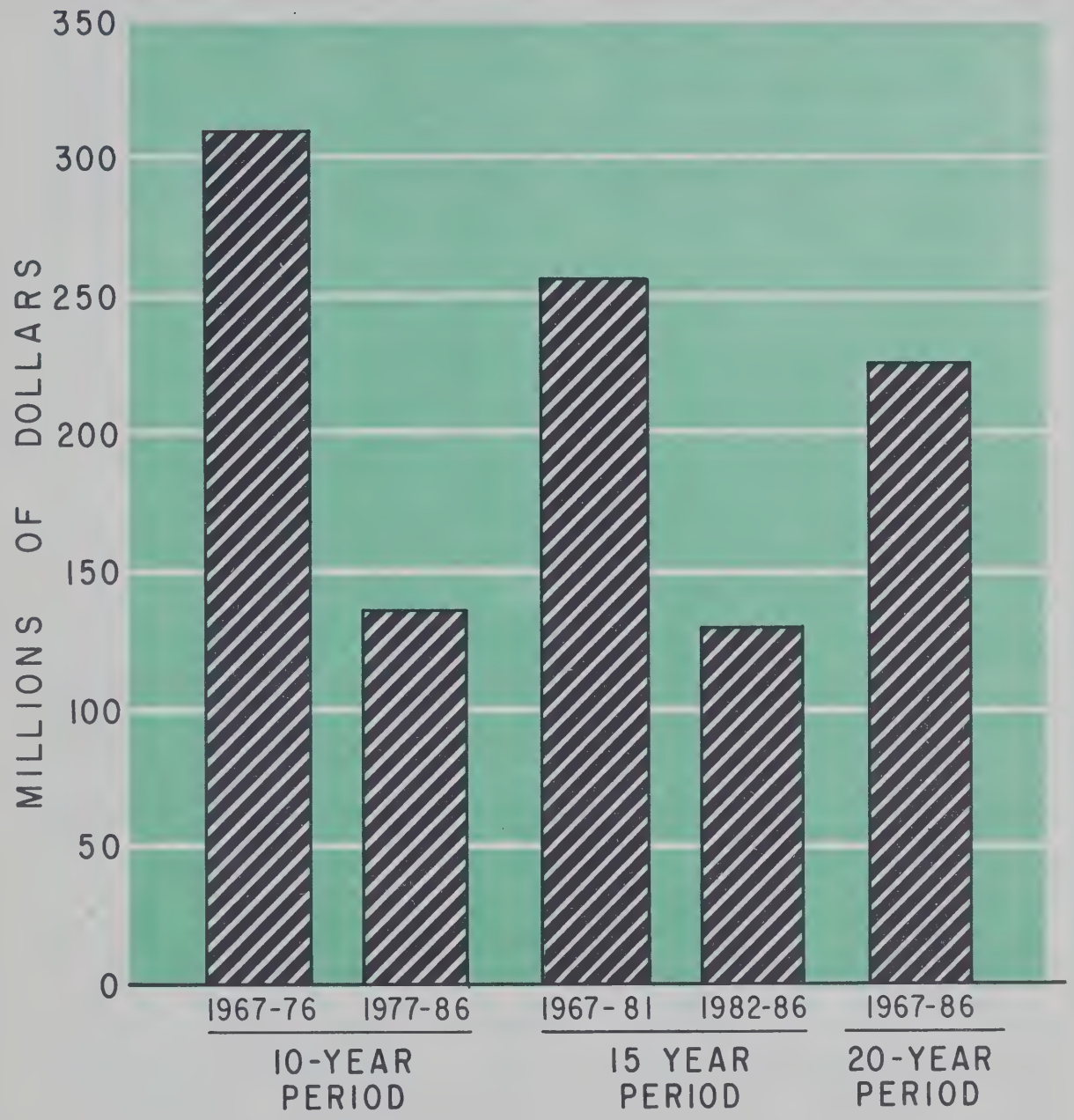
TABLE 19

INTERSTATE HIGHWAY ANNUAL NEEDS

New Jersey

1967-1986

COST ITEM	1967-1976 Rural	1967-1976 Urban	1967-1976 Total	1977-1986 Rural	1977-1986 Urban	1977-1986 Total
			(thousands)			
Initial Construction						
Federal Share	$16,577.5	$56,747.1	$73,324.6	—	—	—
State Share	1,841.9	6,305.2	8,147.1	—	—	—
Subtotal	$18,419.4	$63,052.3	$81,471.7	—	—	—
Replacement Construction	$ 62.1	$ 188.1	$ 250.2	$ 470.3	$1,209.0	$1,679.3
Maintenance	1,444.5	2,651.3	4,095.8	2,238.7	3,911.3	6,150.0
Administration	2,191.9	7,248.1	9,440.0	298.0	563.2	861.2
TOTAL	$22,117.9	$73,139.8	$95,257.7	$3,007.0	$5,683.5	$8,690.5
Net State Share	$ 5,540.4	$16,392.7	$21,933.1	$3,007.0	$5,683.5	$8,690.5



AVERAGE ANNUAL NEEDS
1967-1986
STATE HIGHWAY SYSTEM PROGRAM
NEW JERSEY

Wilbur Smith and Associates

FIGURE 12

state highways are delineated in Table 20. Approximately three fourths of the total needs program is required for urban highway needs, totaling $176,118,200 a year for a 20-year improvement program. Under the same program, rural needs will average $49,702,200 a year.

For a 20-year catch-up program, needs on Class I Major Highways, intended to provide freeway service that is supplemental to the Interstate System, will average $102,866,000 annually, with the principal portion required in urban areas. This amounts to slightly over 45 per cent of the total program needs for state highways. An additional $54,589,000 will be required for Class II Major Highways, and $37,037,200 for Area Service Highways, amounting to 24 per cent and 16 per cent, respectively. Expenditures averaging $14,671,700, or 6.49 per cent of the total State Highway System needs, will be required on Collector Highways while $1,310,200 will be necessary to meet the

TABLE 20

AVERAGE ANNUAL NEEDS BY FUNCTIONAL CLASSIFICATION

Existing State Highway System

New Jersey

1967-1986

FUTURE FUNCTIONAL CLASSIFICATION	*10-YEAR PROGRAM*		*15-YEAR PROGRAM*		*20-YEAR PROGRAM*
	1967-1976	*1977-1986*	*1967-1981*	*1982-1986*	
			(thousands)		
Rural					
Interstate[1]	$ 5,540.4	$ 3,007.0	$ 4,695.9	$ 3,007.0	$ 4,273.7
Class I Major	8,898.0	19,695.7	13,319.3	18,157.8	14,612.6
Class II Major	11,872.6	10,074.7	11,440.3	10,186.8	11,243.3
Area Service	14,408.0	14,283.7	13,228.7	17,860.3	14,569.6
Collectors	6,711.1	3,260.8	5,313.9	3,947.0	4,976.0
Land Access	44.2	6.9	32.7	6.9	27.0
Subtotal	$ 47,474.3	$ 50,328.8	$ 48,030.8	$ 53,165.8	$ 49,702.2
Urban					
Interstate[1]	$ 16,392.7	$ 5,683.5	$ 12,823.0	$ 5,683.5	$ 11,038.1
Class I Major	133,737.0	41,319.0	106,783.2	31,622.9	88,253.4
Class II Major	67,628.0	18,019.5	52,190.6	15,967.2	43,345.7
Area Service	31,314.5	13,891.7	25,249.8	14,800.3	22,467.6
Collectors	13,147.4	6,211.8	11,005.1	6,112.5	9,695.7
Primary Thoroughfare	1,237.2	996.4	1,076.6	1,228.4	1,121.4
Secondary Thoroughfare	278.4	90.9	215.6	94.1	188.8
Commercial	—	—	—	—	—
Residential	7.5	7.5	7.5	7.5	7.5
Subtotal	$263,742.7	$ 86,220.3	$209,351.4	$ 75,516.4	$176,118.2
TOTAL	$311,217.0	$136,549.1	$257,382.2	$128,682.2	$225,820.4

[1]Federal share of initial construction costs excluded.

needs each year on the Primary and Secondary Thoroughfares presently on the State Highway System. Needs on local roads and streets which are included on the present State Highway System average $34,500 a year.

Details of program cost by functional classification of highways showing the costs for construction, maintenance, and administration for each time period are included in Appendix Table 5.

County Highways

In the appraisal of needs on county highways in New Jersey, a dual study process was utilized, as previously indicated. For those highways which were functionally classified as other than local access roads or streets, the same procedure of project-by-project appraisal used on state highways was employed. For local roads and streets on the County Highway System, the mass analysis procedure was followed, and all needs were based on a 20-year catch-up period.

As of January 1, 1967, there were 6,739.9 miles of county highways, of which 2,780.3 miles were in urban areas, and 3,959.6 miles in rural. By 1986, it is expected that there will be 6,742.8 miles of county highways, representing an increase of only 2.9 miles. However, there will be a substantial shift in the rural-urban characteristics of this system. Rural highways will decrease by 1,132.1 miles, while urban facilities will increase by 1,135.0 miles. No costs have been estimated for the construction of new local access roads and streets, as the cost of such facilities is expected to be financed primarily by sources other than public agencies.

Appraisal of principal county highways (which includes all functional classifications except local roads and streets) revealed 790.7 miles with existing deficiencies. This represents 11.7 per cent of the total existing miles in these classifications. As shown in Table 21, 93.3 miles were deficient in surface condition, and 380.6 miles were deficient in surface width. An additional 24.0 miles were found to be deficient in both surface condition and width. Shoulder width acounted for 277.2 miles found to be critically deficient, while alignment accounted for 6.0 deficient miles. The combination of shoulder width and alignment produced an additional 9.6 miles in need of immediate improvement. Of the total critically deficient mileage 85 per cent was on Collector Highways.

Construction Needs — The distribution of construction needs by time period is indicated in Table 22 for county highways. As contained in this table, construction needs for highways classified as other than local roads and streets represent only identified construction needs. Additional construction needs on these facilities include replacement and stopgap. Since replacement and stopgap needs are not determined on a time period basis, but rather are based on the catch-up period assumed for the various programs, these needs have been excluded. Total construction needs for local roads which were determined on a mass analysis basis have been shown as equally divided between the four 5-year time periods. The average annual cost approach as used in the mass analysis procedure, assumes a distribution of a constant amount for each year of the program.

For the principal functional classes of county roads, identified needs total $501,021,000. Of this amount, $23,580,000 will be required for Class II Major Highways, while $20,647,000 will be needed for Area Service Highways. Collector Highways will require the expenditure of $357,001,000. Additional amounts will be necessary for Primary and Secondary Thoroughfares, equaling $53,264,000 and $46,529,000, respectively.

As can be seen in Table 22, 55 per cent of the total needs on primary county highways are in the backlog category, equal to $278,610,000. During the first 5-year time period ending in 1971, $38,832,000 will be required to overcome identified needs, while the second and third time periods will necessitate the expenditure of $73,270,000 and $52,131,000, respectively. The time period from 1982-1986 will require $58,178,000 for identified needs on the County Highway System. The identified needs in the time period from 1972-1976 constitute the second highest amount of the five periods under consideration, equal to 14.6 per cent of the total identified construction needs on the

TABLE 21

MILEAGE OF EXISTING MAJOR DEFICIENCIES ON COUNTY HIGHWAYS

New Jersey

1967

FUNCTIONAL CLASSIFICATION[1]	*SURFACE CONDITION*	*SURFACE WIDTH*	*SURFACE CONDITION AND WIDTH*	*SHOULDER WIDTH*	*ALIGNMENT*	*SHOULDER WIDTH AND ALIGNMENT*	*TOTAL*
Class II Major	1.8	25.3	1.8	—	—	—	28.9
Area Service	0.5	8.0	—	33.3	0.7	6.2	48.7
Collector	72.2	329.9	22.2	243.9	5.3	3.4	676.9
Primary Thoroughfare	2.8	8.8	—	—	—	—	11.6
Secondary Thoroughfare	16.0	8.6	—	—	—	—	24.6
TOTAL	93.3	380.6	24.0	277.2	6.0	9.6	790.7

[1]Includes all functional classifications except land access roads and commercial and residential streets.

NOTE: Mileage with shoulder width or alignment deficiencies which also have surface width or condition deficiencies were included in the latter categories.

TABLE 22

CONSTRUCTION NEEDS BY TIME PERIOD

County Highway System

New Jersey

1967-1986

FUNCTIONAL CLASSIFICATION	*BACKLOG*	*1967-1971*	*1972-1976*	*1977-1981*	*1982-1986*	*TOTAL*
			(thousands)			
			Identified Construction Only			
Class II Major	$15,635	$ 1,624	$ 687	$ 2,241	$ 3,393	$ 23,580
Area Service	7,683	1,545	5,805	2,928	2,686	20,647
Collector	214,656	23,110	48,187	33,562	37,486	357,001
Primary Thoroughfare	17,294	8,710	9,021	9,475	8,764	53,264
Secondary Thoroughfare	23,342	3,843	9,570	3,925	5,849	46,529
TOTAL	$278,610	$ 38,832	$ 73,270	$ 52,131	$ 58,178	$501,021
			Total Construction			
Land Access	$ —	$ 20,576	$ 20,576	$ 20,576	$ 20,576	$ 82,304
Residential	—	17,678	17,678	17,678	17,678	70,712
Commercial	—	516	516	516	516	2,064
TOTAL	$ —	$ 38,770	$ 38,770	$ 38,770	$ 38,770	$155,080

County Highway System. In order of their magnitude, the third highest requirements are found in the period from 1982-1986, equal to 11.6 per cent while 1977-1981 requirements amount to 10.4 per cent and 7.7 per cent of the total identified construction needs are found in the period 1967-1971.

Total construction needs on local roads and streets amount to $155,080,000 during the 20-year period. It is estimated that $38,770,000 will be required for all construction needs on these facilities during each of the four 5-year periods.

The largest single expenditure on principal county highways will be required for base and surfacing; $166,859,000 for this item accounts for 33 per cent of the total identified County Highway System needs. Right-of-way requirements amount to $103,428,000, or slightly over 20 per cent of the total needs while grading and drainage needs of $93,707,000 accounts for 18 per cent and structure improvements of $81,952,000 constitute an additional 16 per cent. The balance of identified needs in the categories of miscellaneous and railroad crossings accounts for an additional 11 per cent, with identified needs of $40,377,000 and $14,698,000, respectively. The tabulation of the needs by cost item is contained in Table 23.

On local access roads and streets, total construction needs of $39,128,000 for grading and drainage, $110,896,000 for base and surface, and $5,056,000 for structure needs account for $155,080,000 required for the present County Highway System in addition to the identified construction needs described above.

TABLE 23

IDENTIFIED CONSTRUCTION NEEDS BY COST ITEM

County Highway System

New Jersey

1967-1986

FUNCTIONAL CLASSIFICATION	RIGHT-OF-WAY	GRADE AND DRAIN	BASE AND SURFACE	MISCELLANEOUS COSTS	RAILROAD CROSSINGS	STRUCTURES	TOTAL
			(thousands)				
Identified Construction							
Class II Major	$ 8,607	$ 3,527	$ 7,229	$ 2,488	$ —	$ 1,729	$ 23,580
Area Service	5,039	4,043	6,753	2,337	306	2,169	20,647
Collector	68,229	67,188	120,230	29,234	9,024	63,096	357,001
Primary Thoroughfare	15,293	10,167	15,534	3,893	2,037	6,340	53,264
Secondary Thoroughfare	6,260	8,782	17,113	2,425	3,331	8,618	46,529
TOTAL	$103,428	$ 93,707	$166,859	$ 40,377	$ 14,698	$ 81,952	$501,021
Total Construction							
Land Access	$ —	$ 21,488	$ 57,457	$ —	$ —	$ 3,360	$ 82,304
Residential	—	17,205	51,825	—	—	1,682	70,712
Commercial	—	435	1,614	—	—	14	2,064
TOTAL	$ —	$ 39,128	$110,896	$ —	$ —	$ 5,056	$155,080

Needs Program — The total 20-year needs for county highways including construction needs and maintenance and administration requirements will average $77,592,400 a year, as shown in Table 24. Of this amount, $28,906,600 will be required in rural areas and $48,685,800 needed in urban areas. Annual needs on local access roads and streets have been assumed as a constant average amount totaling $19,610,700 a year.

For a 10-year program, annual needs total $89,716,000 during the catch-up period, with an average of $65,814,600 required for the last 10 years of the study period. During a catch-up period of 15 years, annual amounts averaging $80,901,700 will be required from 1967 to 1981 and $67,906,800 a year in the last 5 years of the study period.

More than 53 per cent of the total needs on the County Highways System will be required for Collector Highways, including their urban extensions. These needs average $41,198,700 a year for a 20-year program. Needs on Class II Major Highways and Area Service Highways, amounting to $1,783,800 and $2,260,200, respectively, account for slightly over 5 per cent of the average annual needs on the 20-year program. Needs on Primary and Secondary Thoroughfares total $12,739,000 average annual cost, while Local Access Roads and Streets account for $19,610,700 annually, or slightly over 25 per cent of the total average annual needs on a 20-year program.

Detailed breakdowns of annual needs by functional classifications are contained in Appendix Table 6, indicating the cost of construction, maintenance, and administration during 10, 15, and 20-year programs.

TABLE 24

AVERAGE ANNUAL NEEDS BY FUNCTIONAL CLASSIFICATION

Existing County Highway System

1967-1986

FUTURE FUNCTIONAL CLASSIFICATION	*10-YEAR PROGRAM*		*15-YEAR PROGRAM*		*20-YEAR PROGRAM*
	1967-1976	*1977-1986*	*1967-1981*	*1982-1986*	
			(thousands)		
Rural					
Class II Major	$ 2,003.4	$ 454.5	$ 1,484.1	$ 482.8	$ 1,242.6
Area Service	1,192.7	906.1	1,028.5	979.1	991.4
Collectors	21,043.0	11,662.4	17,462.0	12,481.5	16,111.9
Land Access	10,560.7	10,560.7	10,560.7	10,560.7	10,560.7
Subtotal	$34,799.8	$23,583.7	$30,535.3	$24,504.1	$28,906.6
Urban					
Class II Major	$ 420.7	$ 652.1	$ 463.5	$ 756.5	$ 541.2
Area Service	1,476.2	1,055.8	1,361.7	1,015.9	1,268.8
Collectors	29,584.2	20,317.6	26,470.1	21,100.1	25,086.8
Primary Thoroughfare	6,151.6	5,210.8	5,713.8	5,258.9	5,686.6
Secondary Thoroughfare	8,233.5	5,944.6	7,307.3	6,221.3	7,052.4
Commercial	208.6	208.6	208.6	208.6	208.6
Residential	8,841.4	8,841.4	8,841.4	8,841.4	8,841.4
Subtotal	$54,916.2	$42,230.9	$50,366.4	$43,402.7	$48,685.8
TOTAL	$89,716.0	$65,814.6	$80,901.7	$67,906.8	$77,592.4

Municipal Roads and Streets

A dual study procedure similar to the county highway appraisal was used to determine needs on municipal roads and streets. Project-by-project appraisals were made of state and county highways and these needs have been reported. In addition, all municipal facilities functionally classified as other than Land Access Roads and Residential and Commercial Streets were individually appraised on a project-by-project basis, similar to the procedures followed on the state and principal county systems. For Land Access Roads and Residential and Commercial Streets, a mass analysis procedure similar to that used on local rural roads and urban streets on the County Highway System was applied, as previously indicated.

There were 23,597.3 miles of roads and streets under municipal jurisdiction as of January 1, 1967. Of this amount, 1,689.1 miles were classified in principal groups, which included all classifications except Residential and Commercial Streets and Land Access Roads. Residential Streets accounted for 11,788.3 miles, while Commercial Street mileage amounted to 501.6. Land Access Roads totaled 9,618,3 miles. By 1986, the system will increase 9,060.2 miles to a total of 32,657.5 miles. The bulk of this increase is associated with Primary Thoroughfares and those streets classified as Residential Streets. It is assumed that construction needs for the increased mileage of Residential Streets will be borne by revenue sources other than public agencies, and, therefore, only the maintenance and administrative cost requirements for these facilities have been estimated for the time periods in which their construction will occur.

Of the total mileage classified in principal groups, it was determined by field appraisal that 9 per cent, or 157.3 miles, were presently deficient. There were 73.3 miles deficient in surface condition, and 60.8 miles were found to have insufficient surface width. An additional 14.3 miles were found to be deficient for reasons of both surface condition and surface width. The lack of necessary shoulder width accounted for an additional 8.9 miles of facilities requiring immediate attention. The types of deficiencies occurring on each of the functional classifications are shown in Table 25., and it points up the fact that the bulk of these deficiencies occurred on Collector Highways and Secondary Thoroughfares.

TABLE 25

MILEAGE OF EXISTING MAJOR DEFICIENCIES
ON PRINCIPAL MUNICIPAL STREETS

New Jersey

1967

FUNCITIONAL CLASSIFICATION[1]	*SURFACE CONDITION*	*SURFACE WIDTH*	*SURFACE CONDITION AND WIDTH*	*SHOULDER WIDTH*	*TOTAL*
Class II Major	—	2.6	—	—	2.6
Area Service	—	0.5	—	—	.5
Collector	15.3	32.9	8.3	8.9	65.4
Primary Thoroughfare	5.0	3.1	—	—	8.1
Secondary Thoroughfare	53.0	21.7	6.0	—	80.7
TOTAL	73.3	60.8	14.3	8.9	157.3

[1]Includes all functional classifications except land access roads, commercial and residential streets.

NOTE: Mileage with shoulder width or alignment deficiencies which also have surface width or condition deficiencies were included in the latter categories.

Construction Needs — Shown in Table 26 are the construction needs on municipal streets by time period. For principal streets, which include all classifications other than Residential Streets, Commercial Streets, and Land Access Roads, the construction needs shown include only identified construction. In addition, stopgap and replacement construction needs will be required on these facilities. The total identified needs on these facilities amount to $880,228,000. Primary Thoroughfares comprise the greatest portion of these needs, 86 per cent, totaling $759,849,000. The large construction expenditure on these facilities is accounted for by the 990.1 miles of new facilities which must be constructed to meet the needs of expanding urban areas. Secondary Thoroughfares account for $87,437,000 of identified construction needs while Collector Highways and Streets constitute needs of $24,048,000. Class II Major Highways and Area Service Highways contribute an additional $7,093,000 and $1,801,000, respectively. Land Access Roads, Commercial and Residential Streets account for an additional $1,514,842,000 of needs, an amount equal to 1.7 times the identified construction needs on other municipal facilities.

Slightly less than 8 per cent of total identified needs on principal municipal highways and streets are required to overcome existing deficiencies. These backlog needs total $69,479,000. There is a reduction in identified needs during the first 5-year time period, totaling only $18,305,000, equal to only 2 per cent of the total identified needs. Between 1972 and 1976, the identified needs on the municipal highway and street system amount to $31,489,000, or slightly over 3.5 per cent. The greatest needs by time period occur between 1977 and 1981, when identified needs will equal $417,801,000, an amount equal to approximately 47.5 per cent of the total identified needs. A slight reduction occurs in the final time period, from 1982-1986

TABLE 26

CONSTRUCTION NEEDS BY TIME PERIOD

Municipal Street System

New Jersey

1967-1986

FUNCTIONAL CLASSIFICATION	*BACKLOG*	*1967-1971*	*1972-1976*	*1977-1981*	*1982-1986*	*TOTAL*
			(thousands)			
			Identified Construction Only			
Class II Major	$ 7,093	$ —	$ —	$ —	$ —	$ 7,093
Area Service	897	211	349	313	31	1,801
Collector	14,535	3,854	2,436	2,599	624	24,048
Primary Thoroughfare	11,770	1,809	1,151	414,394	330,725	759,849
Secondary Thoroughfare	35,184	12,431	27,553	495	11,774	87,437
TOTAL	$69,479	$ 18,305	$ 31,489	$417,801	$343,154	$ 880,228
			Total Construction			
Land Access	$ —	$107,156	$107,156	$107,157	$107,157	$ 428,626
Commercial	—	30,646	30,647	30,647	30,647	122,587
Residential	—	240,907	240,907	240,907	240,908	963,629
TOTAL	$ —	$378,709	$378,710	$378,711	$378,712	$1,514,842

Included in the appraisal of highway needs is the cost of improvement for railroad grade crossings. While these needs are less significant in terms of magnitude than most roadway cost items, they are nevertheless important items in the highway program because of safety aspects. Requirements for improved crossing protection amount to $8,600,000 on the state system, $14,700,000 on the county system, and $10,400,000 on the municipal system during the study period.

amounting to $343,154,000 or approximately 39 per cent of the total identified needs for the 20-year study period. The large needs in the last two time periods are a result of the new Primary Thoroughfares to be constructed at that time.

Almost 19 per cent of identified needs on principal municipal roads and streets is required for right-of-way. Grading and drainage needs amount to almost 22 per cent, and base and surface requirements account for an additional 22 per cent. The largest single cost item is that classified as miscellaneous, equal to almost 24 per cent of which most is required for Primary Thoroughfares. Railroad grade crossing protection accounts for slightly over 1 per cent, and structure requirements amount to approximately 12.5 per cent of identified needs on principal municipal facilities. Land Access Roads, Commercial Streets, and Residential Streets have combined grading and drainage requirements of $400,974,000, and base and surface needs equal $1,070,655,000 during the 20-year study period. Structure requirements on these facilities will amount to $43,213,000. Construction needs by cost item are arrayed in Table 27.

Needs Program — Average annual construction, maintenance, and administration needs for the Municipal Street System are indicated in Table 28. For a 10-year improvement program, $207,492,500 will be required annually during the first 10 years to overcome all backlog needs and to meet requirements of obsolescing roadways and structures during the period. The 10 years following this catch-up period will require an additional $282,825,900 per year. For a 15-year program, $235,478,700 will be required during the period for attainment of tolerability, and $277,548,600 a year will be required in the last 5 years to retain this level. A program to catch up needs during the 20 years will require $247,120,100 a year. Again, the requirement for large expenditures during the latter stages of the study period is a result of requirements for new Primary Thoroughfares.

Annual expenditures of $476,100 will be required for Class II Major Highways on the Municipal System, and an additional $181,700 will be necessary for Area Service Highways during the 20-year catch-up program. Collector Highways will necessitate the expenditure of an average of $3,312,000. Average annual ex-

TABLE 27

CONSTRUCTION NEEDS BY COST ITEM

Municipal Street System

New Jersey

1967-1986

FUNCTIONAL CLASSIFICATION	RIGHT-OF-WAY	GRADE AND DRAIN	BASE AND SURFACE	MISCELLANEOUS COSTS	RAILROAD CROSSINGS	STRUCTURE	TOTAL
			(thousands)				
Identified Construction							
Class II Major	$ 1,144	$ 1,485	$ 1,494	$ 771	$ 380	$ 1,819	$ 7,093
Area Service	500	184	434	124	223	336	1,801
Collector	1,823	4,074	10,666	1,225	910	5,350	24,048
Primary Thoroughfare	157,644	168,479	137,117	204,351	1,861	90,397	759,849
Secondary Thoroughfare	3,620	16,679	44,700	3,686	7,068	11,684	87,437
TOTAL	$164,731	$190,901	$ 194,411	$210,157	$10,442	$109,586	$ 880,228
Total Construction							
Land Access	$ —	$132,044	$ 278,017	$ —	$ —	$ 18,565	$ 428,626
Commercial	—	29,292	92,444	—	—	851	122,587
Residential	—	239,638	700,194	—	—	23,797	963,629
TOTAL	$ —	$400,974	$1,070,655	$ —	$ —	$ 43,213	$1,514,842

TABLE 28

AVERAGE ANNUAL NEEDS BY FUNCTIONAL CLASSIFICATION

Existing Municipal Highway System

1967-1986

FUTURE FUNCTIONAL CLASSIFICATION	10-YEAR PROGRAM 1967-1976	10-YEAR PROGRAM 1977-1986	15-YEAR PROGRAM 1967-1981	15-YEAR PROGRAM 1982-1986	20-YEAR PROGRAM
			(thousands)		
Rural					
Collectors	$ 1,337.0	$ 579.5	$ 1,054.5	$ 593.2	$ 926.5
Land Access	49,880.9	49,880.9	49,880.9	49,880.9	49,880.9
Subtotal	$ 51,217.9	$ 50,460.4	$ 50,935.4	$ 50,474.1	$ 50,807.4
Urban					
Class II Major	$ 858.7	$ 91.4	$ 603.1	$ 91.2	$ 476.1
Area Service	234.7	148.3	207.2	118.8	181.7
Collectors	2,742.7	2,063.1	2,589.3	1,973.6	2,385.5
Primary Thoroughfare	2,690.0	85,220.4	33,872.2	78,863.4	46,308.1
Secondary Thoroughfare	17,249.7	12,343.5	14,772.7	13,528.7	14,462.5
Commercial	12,411.2	12,411.2	12,411.2	12,411.2	12,411.2
Residential	120,087.6	120,087.6	120,087.6	120,087.6	120,087.6
Subtotal	$156,274.6	$232,365.5	$184,543.3	$227,074.5	$196,312.7
TOTAL	$207,492.5	$282,825.9	$235,478.7	$277,548.6	$247,120.1

penditures during the 20-year catch-up program for Primary Thoroughfares and Secondary Thoroughfares will amount to $46,308,100 and $14,462,500, respectively. Commercial Streets will account for an average annual expenditure of $12,411,200 while Residential Streets during the 20 years will require $120,087,600 average annual expenditure. Land Access Roads will add an additional $49,880,900 average annual cost during the 20 years. The average annual cost for the three categories of access facilities (Land Access Roads, Commercial Streets, and Residential Streets) has been assumed to be the same for each year in each of the three programs. Detailed tables showing the cost for construction, maintenance, and administration for each of the programs are included in Appendix Table 7 for each functional classification found on the Municipal Road and Street System.

Other Governmental Agencies

As of the beginning of the study period, there were 851.5 miles of highways under the jurisdiction of other governmental agencies. Toll highways accounted for 370.3 miles, while forest, park, and institutional roads amounted to 481.2 miles. Needs on these facilities and revenues for these facilities are considered to be offsetting and are not included in the analyses of this study.

Summary of Needs by Systems

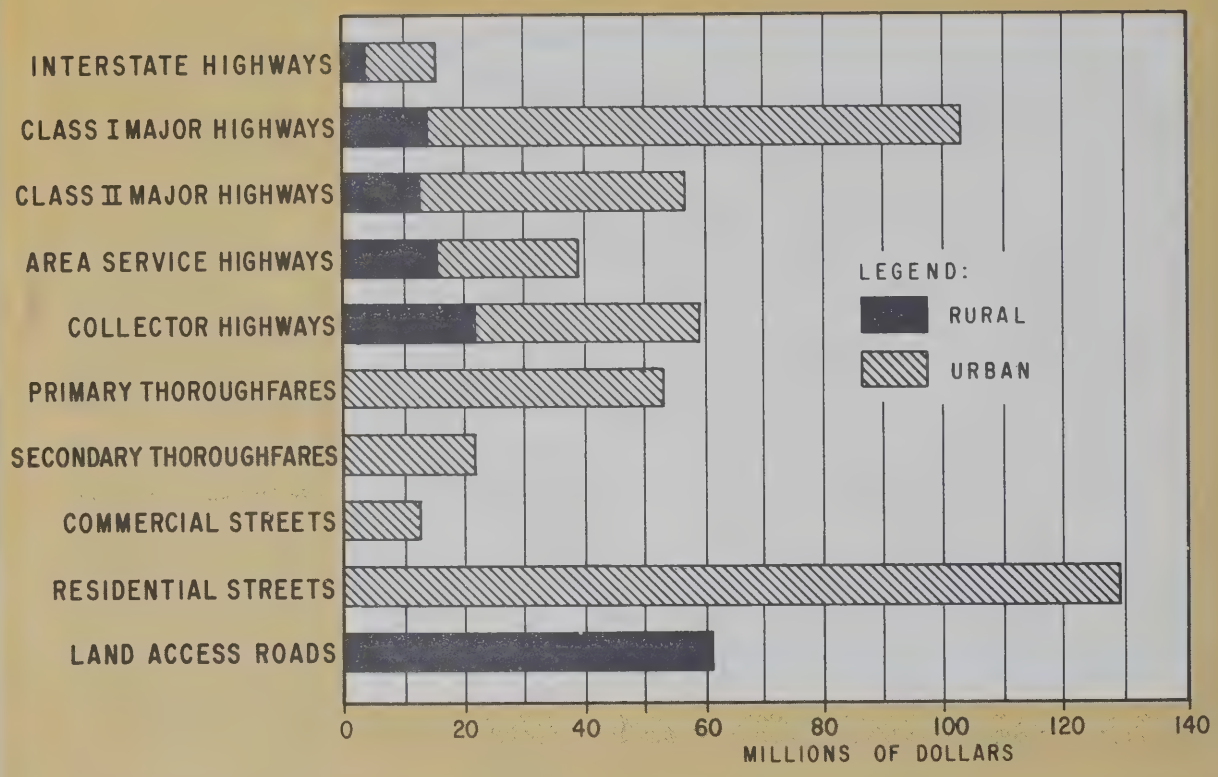
The principal objective of a comprehensive statewide highway needs study is to provide the basis for a highway finance plan which encompasses all roads and streets and provides for the apportionment of available funds to ensure equitable development of each of the several systems of roads and streets. This does not imply that all roads and streets should be improved to an appropriate level of service at the same rate, but rather that the rate of improvement should be consistent with the type of service or functional classification of the road or street system.

Throughout the appraisal of needs, the functional classification system was the predominant control in the application of design standards, and estimating of construction, maintenance, and administration costs. Therefore, costs for similar improvements for a particular functional classification would be the same regardless of the administrative system on which facilities were located. This approach is consistent with the philosophy that the type of facility provided should be commensurate with the function served, regardless of whether it is under state or local administrative responsibility.

The appraisal of needs reported in this chapter includes construction, maintenance, and administrative requirements for all existing roads and streets in the state which are under the administrative jurisdiction of the state, county, or city governments. Proposed new facilities have also been included when it was apparent that needs were directly related to the provision of highway traffic services. These situations included extension and connection of key highways and municipal streets to provide integrated networks serving major traffic flow corridors as well as connections to Interstate System interchanges. New facilities also include additional miles of Class I Major Highways (providing freeway service supplemental to the Interstate System and toll highways) which will be required by the heavy increases in traffic volumes expected in the next two decades. Additional mileage has also been included for additional highways and streets in anticipation of growth in urban areas. The full construction, maintenance, and administration cost for these new facilities are included in the needs estimate except for residential streets. The assumption is made that the construction of new residential streets will be performed by those developing new residential areas. The present pattern, however, is for such facilities to be transferred to municipal jurisdiction for maintenance and administration. Therefore costs have been assumed for the maintenance and administration of these new Residential Streets during the time periods when they are assumed to be constructed.

Total programs for each of the functional classifications of highways and streets in New Jersey are shown in Figure 13 for the 20-year improvement program. A comparison between 10, 15, and 20-year catch-up programs is presented in Table 29. Included in the appropriate functional classifications are the needs for highways which are recommended for transfer between the state, county and municipal governments. In each case, it has been assumed that the Interstate System will be completed by 1975, according to the program established by Congress. Also, the 10 and 15-year programs do not provide for accelerated catch ups on Land Access Roads, Commercial Streets, or Residential Streets administered by municipalities. For each of these classifications, the 20-year program period determined in the mass analysis procedure has been assumed, regardless of the catch-up period for the more important traffic arteries.

A total of $550,532,900 will be required annually for a 20-year program on all classes of roads and streets. Of this amount, $129,416,200 will be required in rural areas and $421,116,700 within the boundaries of the urban complexes. The Interstate System will cost $15,311,800 a year, excluding the federal share of initial construction cost. Class I Major Highways will require an annual average expenditure of $102,866,000, producing a total of $118,177,800 a year for facilities to provide freeway type service ,exclusive of federal-aid Interstate funds. This amounts to 21 per cent of total needs for a 20-year program. Needs for Class II Major Highways amount to approximately half of this figure, equal to $56,848,900 annually. Area



AVERAGE ANNUAL 20-YEAR NEEDS BY FUNCTIONAL CLASSIFICATION

NEW JERSEY

1967-1986

Wilbur Smith and Associates

FIGURE 13

Service Highways will require $39,479,100 per year, and Collector Highway needs will amount to an average of $59,182,400 per year. Area Service Highway needs and Collector needs will constitute 10 per cent and 7 per cent of the average annual total needs, respectively.

Approximately 13 per cent of the total annual average needs will be represented by the Primary and Secondary Thoroughfares. The average annual costs for these two types of facilities will aggregate $74,819,800. Commercial Street needs represent a relatively minor item, equaling $12,619,800 average annual expenditure. Residential Street needs, however, loom as the largest single category of average annual needs requirements, amounting to $128,936,500 per year, equal to 23 per cent of the total average annual needs. Land Access Roads will require an expenditure of $60,468,600 annually, equal to almost 11 per cent of total needs.

The average annual needs by recommended adminstrative system for each of the three program periods are presented in Table 30. A detailed enumeration of average annual needs for each recommended system is tabulated in the Appendix to this report. The identified, stopgap and replacement construction costs, mainte-

TABLE 29

AVERAGE ANNUAL NEEDS BY FUNCTIONAL CLASSIFICATION

New Jersey

1967-1986

FUTURE FUNCTIONAL CLASSIFICATION	10-YEAR PROGRAM 1967-1976	10-YEAR PROGRAM 1977-1986	15-YEAR PROGRAM 1967-1981	15-YEAR PROGRAM 1982-1986	20-YEAR PROGRAM
			(thousands)		
Rural					
Interstate	$ 5,540.4	$ 3,007.0	$ 4,695.9	$ 3,007.0	$ 4,273.7
Class I Major	8,898.0	19,695.7	13,319.3	18,157.8	14,612.6
Class II Major	13,876.0	10,529.2	12,924.4	10,669.6	12,485.9
Area Service	15,600.7	15,189.8	14,257.2	18,839.4	15,561.0
Collectors	29,091.1	15,502.7	23,830.4	17,021.7	22,014.4
Land Access	60,485.8	60,448.5	60,474.3	60,448.5	60,468.6
Subtotal	$133,492.0	$124,372.9	$129,501.5	$128,144.0	$129,416.2
Urban					
Interstate	$ 16,392.7	$ 5,683.5	$ 12,823.0	$ 5,683.5	$ 11,038.1
Class I Major	133,737.0	41,319.0	106,783.2	31,622.9	88,253.4
Class II Major	68,907.4	18,763.0	53,257.2	16,814.9	44,363.0
Area Service	33,025.4	15,095.8	26,818.7	15,935.0	23,918.1
Collectors	45,474.3	28,592.5	40,064.5	29,186.2	37,168.0
Primary Thoroughfare	10,078.8	91,427.6	40,662.6	85,350.7	53,116.1
Secondary Thoroughfare	25,761.6	18,379.0	22,295.6	19,844.1	21,703.7
Commercial	12,619.8	12,619.8	12,619.8	12,619.8	12,619.8
Residential	128,936.5	128,936.5	128,936.5	128,936.5	128,936.5
Subtotal	$474,933.5	$360,816.7	$444,261.1	$345,993.6	$421,116.7
TOTAL	$608,425.5	$485,189.6	$573,762.6	$474,137.6	$550,532.9

nance and administrative costs for the recommended State Highway System are presented in Appendix Table 8. Data for the recommended county and municipal systems are available in Appendix Tables 9 and 10, respectively.

Summarized in Table 31 are average annual needs for each administrative system for 10, 15, and 20-year programs, with a comparison presented between the administrative systems as they now exist and as they would exist based on the recommended transfer of mileages by functional classification. It will be noted that in each of the programs the state and county requirements decrease with the adoption of the recommended system, but that the municipal needs increase.

TABLE 30

AVERAGE ANNUAL NEEDS BY FUNCTIONAL CLASSIFICATION

Recommended System

New Jersey

1967-1986

FUNCTIONAL CLASSIFICATION	10-YEAR PROGRAM 1967-1976	10-YEAR PROGRAM 1977-1986	15-YEAR PROGRAM 1967-1981	15-YEAR PROGRAM 1982-1986	20-YEAR PROGRAM
			(thousands)		
Recommended State System					
Rural					
Interstate[1]	$ 5,540.4	$ 3,007.0	$ 4,695.9	$ 3,007.0	$ 4,273.7
Class I Major	8,898.0	19,695.7	13,319.3	18,157.8	14,612.6
Class II Major	13,876.0	10,529.2	12,924.4	10,669.6	12,485.9
Area Service	15,600.7	15,189.8	14,257.2	18,839.4	15,561.0
Subtotal	$ 43,915.1	$ 48,421.7	$ 45,196.8	$ 50,673.8	$ 46,933.2
Urban					
Interstate[1]	$ 16,392.7	$ 5,683.5	$ 12,823.0	$ 5,683.5	$ 11,038.1
Class I Major	133,737.0	41,319.0	106,783.2	31,622.9	88,253.4
Class II Major	68,907.4	18,763.0	53,257.2	16,814.9	44,363.0
Area Service	33,025.4	15,095.8	26,818.7	15,935.0	23,918.1
Subtotal	$252,062.5	$ 80,861.3	$199,682.1	$ 70,056.3	$167,572.6
TOTAL STATE SYSTEM	$295,977.6	$129,283.0	$244,878.9	$120,730.1	$214,505.8
Recommended County System					
Rural					
Collectors	$ 29,091.1	$ 15,502.7	$ 23,830.4	$ 17,021.7	$ 22,014.4
Urban					
Collectors	45,474.3	28,592.5	40,064.5	29,186.2	37,168.0
TOTAL COUNTY SYSTEM	$ 74,565.4	$ 44,095.2	$ 63,894.9	$ 46,207.9	$ 59,182.4
Recommended Municipal System					
Rural					
Land Access	$ 60,485.8	$ 60,448.5	$ 60,474.3	$ 60,448.5	$ 60,468.6
Urban					
Primary Thoroughfare	$ 10,078.8	$ 91,427.6	$ 40,662.6	$ 85,350.7	$ 53,116.1
Secondary Thoroughfare	25,761.6	18,379.0	22,295.6	19,844.1	21,703.7
Commercial	12,619.8	12,619.8	12,619.8	12,619.8	12,619.8
Residential	128,936.5	128,936.5	128,936.5	128,936.5	128,936.5
Subtotal	$177,396.7	$251,362.9	$204,514.5	$246,751.1	$216,376.1
TOTAL MUNICIPAL SYSTEM	$237,882.5	$311,811.4	$264,988.8	$307,199.6	$276,844.7

[1]Federal share of initial construction costs excluded.

TABLE 31

AVERAGE ANNUAL NEEDS BY ADMINISTRATIVE SYSTEMS

New Jersey

1967-1986

ADMINISTRATIVE SYSTEM	EXISTING SYSTEM		RECOMMENDED SYSTEM	
	During Catch-up	After Catch-up	During Catch-up	After Catch-up
	(thousands)			
10-YEAR PROGRAM				
State	$311,217.0	$136,549.1	$295,977.6	$129,283.0
County	89,716.0	65,814.6	74,565.4	44,095.2
Municipal	207,492.5	282,825.9	237,882.5	311,811.4
TOTAL	$608,425.5	$485,189.6	$608,425.5	$485,189.6
15-YEAR PROGRAM				
State	$257,382.2	$128,682.2	$244,878.9	$120,730.1
County	80,901.7	67,906.8	63,894.9	46,207.9
Municipal	235,478.7	277,548.6	264,988.8	307,199.6
TOTAL	$573,762.6	$474,137.6	$573,762.6	$474,137.6
20-YEAR PROGRAM				
State	$225,820.4	—	$214,505.8	—
County	77,592.4	—	59,182.4	—
Municipal	247,120.1	—	276,844.7	—
TOTAL	$550,532.9	—	$550,532.9	—

Based on the recommended assignments of administrative jurisdiction, the annual requirement under a 20-year improvement program for state highways would be reduced by $11,314,600 per year to an annual average cost of $214,505,800. The county highway program would be decreased by $18,410,000 to an annual average cost of $59,182,400. Municipal governments would realize an increase in their needs of $29,724,600 to an annual average cost of $276,844,700.

As can be seen in Table 31, lengthening of improvement programs will reduce the annual requirements during the catch-up period on the state and county systems, under both existing and recommended systems. However, the municipal annual average needs will increase by extending the program because of the expenditures for new facliities in the last 10 years of the program. Statewide needs of $608,425,500 would be required annually during a 10-year catch-up period, while $573,762,600 would be

necessary annually during the 15-year catch-up program. The 20-year average annual needs of $550,532,900 represent a reduction of 9.5 per cent from annual requirements of a 10-year catch-up period, and 4 per cent from the requirements of a 15-year catch-up period.

Regardless of the length of the program period assumed for catchup of needed contribution, the total cost of constructing needed improvements and maintaining and operating the highway system for the entire 20-year period is almost constant with minor variations occurring in needs for stopgap and replacement construction and for maintenance. The variations in these result in a slight increase in program cost as the catch-up period is extended. The slight increase is so small as to be insignificant however in comparison with loss of economic benefits resulting from the use of an inadequate highway system during deferment of needed construction. Both of these factors point to the need for early construction of needed improvements.

Total needs for the entire 20-year period are shown in Table 32 for the existing and recommended administrative systems, for 10, 15, and 20-year programs. The grand total needs, excluding the federal share of the Interstate System, range from $10,936,151,000 for a 10-year program to $11,010,658,000 when the entire 20-year period is used to attain an adequate level of service.

TABLE 32

TOTAL 20-YEAR NEEDS BY ADMINISTRATIVE SYSTEM

New Jersey

1967-1986

ADMINISTRATIVE SYSTEM	*EXISTING SYSTEM*	*RECOMMENDED SYSTEM*
	(thousands)	
10-YEAR PROGRAM		
State	$ 4,477,661.0	$ 4,252,606.0
County	1,555,306.0	1,186,606.0
Municipal	4,903,184.0	5,496,939.0
TOTAL	$10,936,151.0	$10,936,151.0
15-YEAR PROGRAM		
State	$ 4,504,144.0	$ 4,276,834.0
County	1,553,059.5	1,189,463.0
Municipal	4,919,923.5	5,510,830.0
TOTAL	$10,977,127.0	$10,977,127.0
20-YEAR PROGRAM		
State	$ 4,516,408.0	$ 4,290,116.0
County	1,551,848.0	1,183,648.0
Municipal	4,942,402.0	5,536,894.0
TOTAL	$11,010,658.0	$11,010,658.0

PRESENT AND FUTURE REVENUES FOR HIGHWAYS

Chapter 6

At the beginning of the motor vehicle era, roads were largely a responsibility of local governments. When state systems began to emerge, highway-user taxes were introduced first in the form of motor vehicle registration fees. As development of state systems accelerated, taxes were levied on motor fuel to help defray mounting costs of these facilities. In recent years, most state systems have been financed almost entirely from highway-user taxes, and these revenues have generally been shared with local governments for financing more important segments of local systems.

The division of state collected highway-user revenues between state and local governments varies widely among states and has long been a concern of legislators and highway administrators. Another concern has been the proportions of highway costs to be defrayed by direct taxes on motor vehicles and their use, and by general funds or special assessments on property. Questions also arise as to the governmental level at which highway taxes can most efficiently and effectively be collected. Counties and cities are creations of states and derive their taxing powers from them. The states hold the superior taxing power and many taxes by their nature are more logically collected at the state level.

For long-range planning, it is necessary to analyze present collections and distributions of highway revenues at all levels of government. Estimates of future collections of revenues are based on the assumption that present tax rates and distribution policies will remain in effect throughout the highway development period. Recommendations for changes consider estimates of future revenues, findings of other phases of the study which analyze needs by functional systems and administrative responsibility, allocation of costs between highway users and nonusers and among classes of users, and tax potentials of state, county, and municipal governments.

In New Jersey, state highway-user tax revenues are paid into the state general fund and appropriations for state facilities and services are made from that fund. This, however, does not preclude analysis of highway-user revenues in relation to highway costs and needs. Registration fees and motor fuel taxes constitute the greater part of highway-user revenues in most states. Also federal funds are highway-user-tax revenues at their source. Other highway-user taxes are collected from mileage or gross receipts and are generally designated as "third structure" taxes. State and local general funds or nonuser taxes account for the balance of highway funds.

Registration fees are fixed in amount and

STUDY AREA

Wilbur Smith and Associates

FIGURE 14

do not vary with use of highways. Motor fuel taxes and third structure taxes are determined, directly or indirectly, by amount of use of highways.

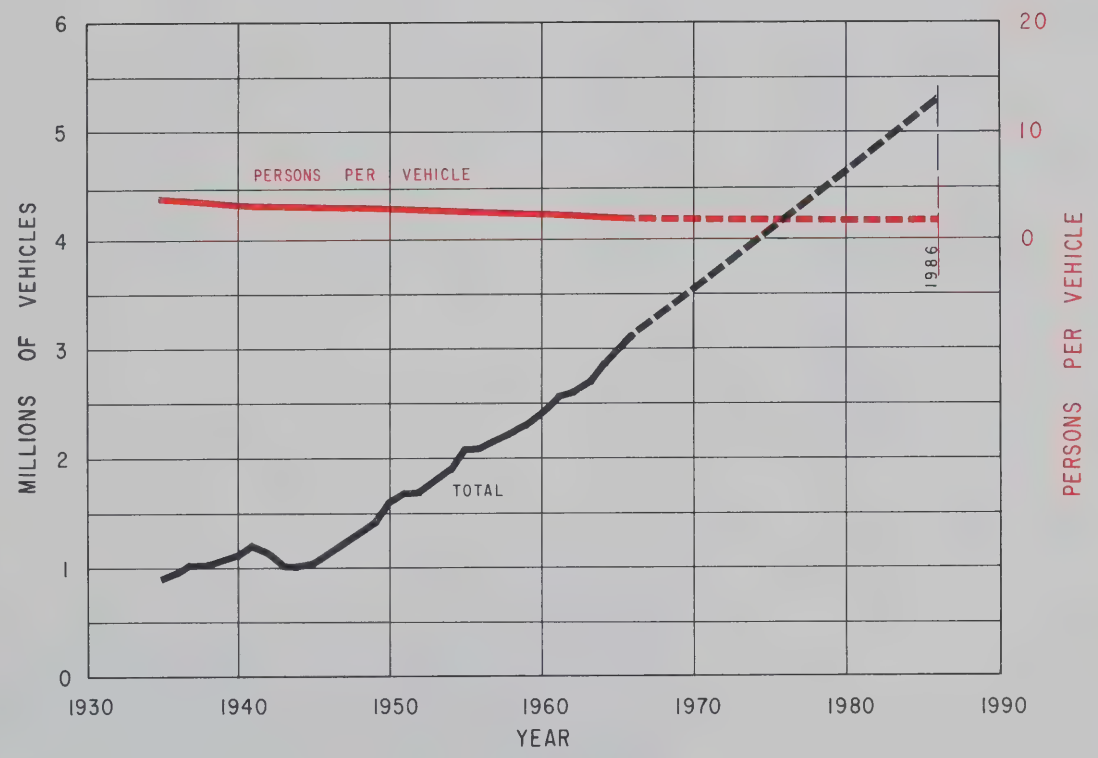
Analyses of tax rates and revenue collections include comparisons with states adjoining New Jeresy. When appropriate, comparisons are also made with averages for the study area and the United States. The study area is shown in Figure 14.

Motor Vehicle Registration, Fees, and Revenues

The number of motor vehicles registered in New Jersey has increased steadily since World War II. Providing facilities for many additional vehicles has placed continuous pressure on highway authorities to maintain travelways in condition to render efficient and safe service. Registration of vehicles has increased at a greater rate than population and this trend is expected to continue.

Number of Vehicles

The trend in motor vehicle registration from 1935 to 1966 and projected to 1986 is shown in Figure 15 along with the trend in the number of persons per registered vehicle. In 1935, there were 899,000 vehicles registered in New Jersey, and by 1966, the number had increased to 3,131,000. The increase since 1956 was 48 per cent, and since 1961, 24 per cent, indicating sustained growth during the last 10 years.



MOTOR VEHICLE REGISTRATIONS
NEW JERSEY
1935-1966, PROJECTED TO 1986

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FIGURE 15

In 1938 there were approximately 3.8 persons in New Jersey for every registered motor vehicle; by 1966, there was a motor vehicle for every 2.2 persons. These values represented a decrease from 51.9 in 1910 and 36.4 in 1915.[1] In the United States, there was an average of approximately 2.1 persons per vehicle in 1966. This downward trend means that the number of vehicles is increasing faster than the population, reflecting a trend toward multivehicle families, and increasing dependence on motor vehicles in commerce, industry, and private use. Rising incomes, greater savings, and availability of installment credit for long maturity have contributed much to the gain in numbers of vehicles.

The growth rates of automobiles and commercial vehicles in New Jersey are significant. In 1950, after substantial recovery had been made from restricted production during World War II, automobiles constituted almost 86 per cent of total vehicles. By 1966, this value had increased to only 89 per cent of the total. The number of automobiles in 1986 is estimated to be 4,645,000, or 88 per cent of the total. The number of trucks and buses should be 621,000 and 14,000, respectively, making a total of 5,280,000 vehicles.

The number of automobiles registered in New Jersey and adjacent states from 1955 through 1966 is presented in Table 33. In 1955, the number of passenger cars registered in New Jersey totaled 1.8 million, and by 1966, the number had increased 54.4 per cent to 2.8 million. Among the study area states, Connecticut, Delaware, and Maryland showed the highest rate of increase in automobiles between 1955 and 1966 with 63.2, 63.4, and 66.8 per cent, respectively.

Truck registrations for New Jersey, the study areas, and the United States are shown in Table 34. The number of licensed trucks in New Jersey increased from 246,187 in 1955 to 325,054 in 1966, or 32.0 per cent. The rise in truck registrations was considerably less than the 88.1 per cent in Delaware, or 49.5 per cent for the United States.

However, New Jersey did exceed the study area average of 25 per cent.

Growth trends in total vehicles are compared in Table 35 for the states in the study area for 1955-1966. For the 12-year period, Delaware had the highest growth of 66.7 per cent, followed closely by Maryland. The smallest growth occurred in New York, which experienced a gain of 32.7 per cent. The gain in New Jersey was 51.5 per cent — higher than the average for the study area or for continental United States.

Registration Fees

Automobiles are registered in New Jersey on the basis of manufacturer's shipping weight at fees shown in Table 36. The amounts include $1.00 annual inspection fee.

[1]Figures furnished by New Jersey Department of Transportation.

Since 1935, motor vehicle registrations have increased by almost 3.5 times and there is presently one vehicle for every 2.2 persons in the state. In 1966, passenger cars paid an average registration fee of $15, and trucks averaged $85 per vehicle. Registration fees for both classes of vehicles are based on a graduated fee related to vehicle weight.

TABLE 33

AUTOMOBILE REGISTRATION TRENDS

New Jersey, Study Area, and the United States

1955-1966

YEAR	REGISTRATIONS								
	New Jersey	*Connecticut*	*Delaware*	*Maryland*	*New York*	*Pennsylvania*	*Rhode Island*	*Study Area*	*United States*[1]
1955	1,807,071	811,287	133,241	803,796	4,131,794	3,208,177	270,235	11,153,467	52,173,234
1956	1,845,460	847,094	140,578	853,018	4,280,637	3,348,290	278,395	11,580,077	54,200,784
1957	1,890,340	882,839	146,440	887,502	4,272,518	3,433,134	281,915	11,779,333	55,906,195
1958	1,969,114	902,439	150,139	905,513	4,367,918	3,491,352	285,980	12,055,501	56,870,684
1959	2,030,166	935,686	156,858	956,539	4,493,817	3,599,026	294,295	12,447,914	59,326,046
1960	2,123,014	979,143	163,228	1,006,699	4,513,719	3,725,632	302,713	12,794,112	61,424,831
1961	2,248,295	1,011,109	168,670	1,033,991	4,630,064	3,804,749	309,232	13,184,710	62,998,787
1962	2,313,047	1,061,769	176,600	1,090,885	4,784,356	3,915,407	319,048	13,637,588	65,646,153
1963	2,439,864	1,132,891	186,561	1,151,909	4,942,780	4,034,588	332,147	14,195,276	68,726,818
1964	2,548,858	1,189,733	198,395	1,224,549	5,112,205	4,203,920	347,035	14,824,695	71,662,196
1965	2,654,571	1,254,811	204,485	1,298,702	5,309,298	4,341,988	362,249	15,426,104	74,905,428
1966	2,789,497	1,324,074	217,757	1,340,672	5,513,812	4,545,056	376,319	16,107,187	77,995,304
Per Cent Increase									
1955-1966	54.4	63.2	63.4	66.8	33.4	41.7	39.3	44.4	49.5
1960-1966	31.4	35.2	33.4	33.2	22.2	22.0	24.3	25.9	27.0

[1]Forty-eight states and the District of Columbia.

SOURCE: United States Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table MV-1, respective years. Figures for Delaware corrected in accordance with *Highway Statistics, Summary to 1965*, Table MV-201.

TABLE 34

TRUCK REGISTRATION TRENDS

New Jersey, Study Area, and the United States

1955-1966

YEAR	REGISTRATIONS								
	New Jersey	*Connecticut*	*Delaware*	*Maryland*	*New York*	*Pennsylvania*	*Rhode Island*	*Study Area*	*United States*[1]
1955	246,187	106,669	20,118	129,209	492,709	516,354	36,962	1,560,342	10,331,912
1956	259,979	120,363	23,063	134,365	504,825	518,903	37,869	1,612,762	10,694,262
1957	268,543	121,439	23,735	136,315	485,680	542,524	37,646	1,631,237	10,960,814
1958	263,329	122,702	26,061	135,067	488,895	549,341	37,166	1,639,515	11,158,561
1959	269,196	122,706	27,694	140,615	498,093	564,400	36,941	1,678,118	11,621,604
1960	270,296	124,300	28,378	143,030	533,363	548,162	37,017	1,704,582	11,893,427
1961	277,678	128,264	29,986	144,402	549,208	551,686	37,646	1,740,270	12,237,240
1962	287,727	132,683	32,399	149,114	564,151	558,016	39,053	1,786,667	12,749,215
1963	293,366	137,309	34,783	156,301	574,609	579,095	40,118	1,841,045	13,360,111
1964	303,821	149,302	35,549	163,561	590,099	598,655	41,678	1,882,665	13,951,656
1965	316,935	155,858	38,969	175,136	602,953	610,962	43,263	1,944,076	14,719,180
1966	325,054	160,579	37,846	185,721	622,095	636,337	46,067	2,013,699	15,443,545
Per Cent Increase									
1955-1966	32.0	50.5	88.1	43.7	26.3	23.2	24.6	29.1	49.5
1960-1966	20.3	29.2	33.4	29.8	16.6	16.1	24.4	18.1	29.8

[1]Forty-eight states and the District of Columbia.

SOURCE: United States Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table MV-1, respective years. Figures for Delaware corrected in accordance with *Highway Statistics, Summary to 1965*, Table MV-201.

TABLE 35

TOTAL MOTOR VEHICLE REGISTRATIONS

New Jersey, Study Area, and the United States

1955-1966

YEAR	REGISTRATIONS								
	New Jersey	*Connecticut*	*Delaware*	*Maryland*	*New York*	*Pennsylvania*	*Rhode Island*	*Study Area*	*United States*[1]
1955	2,060,963	921,229	153,881	938,295	4,642,728	3,737,260	308,148	12,762,504	62,760,395
1956	2,113,560	970,750	164,281	992,512	4,804,658	3,880,773	317,196	13,243,730	65,153,810
1957	2,166,453	1,007,653	170,840	1,028,457	4,771,649	3,989,299	320,425	13,460,776	67,131,071
1958	2,240,597	1,028,715	176,933	1,045,452	4,876,748	4,054,108	324,170	13,746,723	68,299,408
1959	2,306,871	1,061,069	185,178	1,102,258	5,011,467	4,176,661	332,111	14,175,615	71,211,868
1960	2,401,062	1,107,353	192,234	1,155,051	5,067,012	4,286,898	340,598	14,550,208	73,589,518
1961	2,533,768	1,143,500	199,351	1,183,931	5,199,701	4,370,084	347,724	14,978,059	75,514,786
1962	2,608,610	1,198,604	209,695	1,245,695	5,371,166	4,486,802	358,960	15,479,532	78,679,615
1963	2,741,493	1,274,594	222,088	1,314,213	5,540,769	4,628,034	373,078	16,094,269	82,383,764
1964	2,861,104	1,343,459	234,721	1,394,475	5,726,685	4,817,482	389,574	16,767,500	85,918,211
1965	2,979,631	1,414,565	244,322	1,480,966	5,938,517	4,967,768	406,458	17,432,227	89,951,205
1966	3,122,876	1,489,148	256,481	1,533,643	6,162,374	5,196,174	423,433	18,184,129	93,759,950
Per Cent Increase									
1955-1966	51.5	61.6	66.7	63.4	32.7	39.0	37.4	42.5	49.4
1960-1966	30.1	34.5	33.4	32.8	21.6	21.2	24.3	25.0	27.4

[1]Forty-eight states and the District of Columbia.

SOURCE: United States Department of Commerce, Bureau of Public Roads, *Highway Statistics,* Table MV-1, respective years.

TABLE 36

REGISTRATION FEES — AUTOMOBILES

New Jersey

Effective April 1, 1967

WEIGHT CLASS	*WEIGHT*	*REGISTRATION FEE*
1	Less than 2,700 pounds	$10.00
2	2,700 to 3,800 pounds	15.00
3	Over 3,800 pounds	25.00

Registration fees for trucks, road tractors, and truck tractors are shown in Table 37. The fees are based on gross weight of vehicles or combination plus load carried. Vehicles having gross weights under 1,000 pounds pay a fee of $11.00, including $1.00 inspection fee, and the charges increase to $461.00 for vehicles weighing from 68,001 to 72,000 pounds, the heaviest allowed on highways without special permits. Trailers and semitrailers pay a flat fee of $15.00 plus $1.00 inspection fee. Utility and house-type trailers are charged $5.00 for gross weights under 2,000 pounds and $10.00 for heavier units, plus $1.00 inspection fee.

Farm trucks in New Jersey pay one half the fee charged for trucks, and farm tractors pay $3.00 per year. Other farm machinery and implements not used for hire pay $1.00 annually. This also applies to equipment of nonresident seasonal workers.

Other charges for miscellaneous vehicles include well drilling equipment, $3.00 per year, and dealers, $100.00 business license plus $75.00 for five registration plates. Construction vehicles may be operated under a general registration number with "temporary" or "in-transit" plates for a fee of $50.00, which includes five sets

TABLE 37

REGISTRATION FEES — TRUCKS, ROAD TRACTORS, AND TRUCK TRACTORS

New Jersey

Effective April 1, 1967

GROSS WEIGHT VEHICLE AND LOAD (pounds)	*REGISTRATION FEE*	*GROSS WEIGHT VEHICLE AND LOAD (pounds)*	*REGISTRATION FEE*
1,000 or less	$ 11.00	25,001-28,000	$151.00
1,001- 2,000	16.00	28,001-32,000	181.00
2,001- 3,000	21.00	32,001-36,000	211.00
3,001- 4,000	26.00	36,001-40,000	241.00
4,001- 5,000	31.00	40,001-44,000	271.00
5,001- 6,000	36.00	44,001-48,000	296.00
6,001- 8,000	41.00	48,001-52,000	326.00
8,001-10,000	51.00	52,001-56,000	351.00
10,001-13,000	61.00	56,001-60,000	381.00
13,001-16,000	76.00	60,001-64,000	411.00
16,001-19,000	91.00	64,001-68,000	436.00
19,001-22,000	111.00	68,001-72,000	461.00
22,001-25,000	131.00		

TABLE 38

REGISTRATION FEES

Interstate Passenger Carriers

New Jersey

1967

PASSENGER CAPACITY	FEE
12 or less	$21.00
13 to 17	26.00
18 to 22	31.00
23 to 26	36.00
27 to 30	41.00
over 30	40.00 plus $2.00 per passenger over 30

of plates. Trucks, tractors, and trailers actually engaged in construction work and not operating more than 30 miles from construction site pay $15.00 per 1,000 pounds of gross weight if weight exceeds 40,000 pounds. If "constructor" plates are not issued, commercial plates are required and vehicle is subject to axle weight limitations, whereas "constructor" plates are not. Hearses and ambulances are classed as passenger vehicles but pay same fee as trucks.

For-hire intrastate passenger carriers are registered under the schedule shown in Table 38. Interstate passenger carriers pay the same fees as intrastate carriers, plus special fees of $0.005 per route mile operated in New Jersey, except in municipalities which impose a franchise tax. All for-hire property carriers pay the same fees as private vehicles of the same class and weight. Passenger carriers are subject to reciprocity laws and reciprocity is granted interstate carriers to the extent that the operator's home state grants similar privileges to New Jersey residents.

A comparison of average registration fees for 1965 is shown in Table 39 and Figure 16 for New Jersey and other states in the study area. These are average fees derived from total registration revenues and total vehicles registered. Truck revenues include fees from trailers and mileage or other third structure taxes, but the vehicles include only powered units. Motorcycles are excluded from vehicle counts, but

TABLE 39

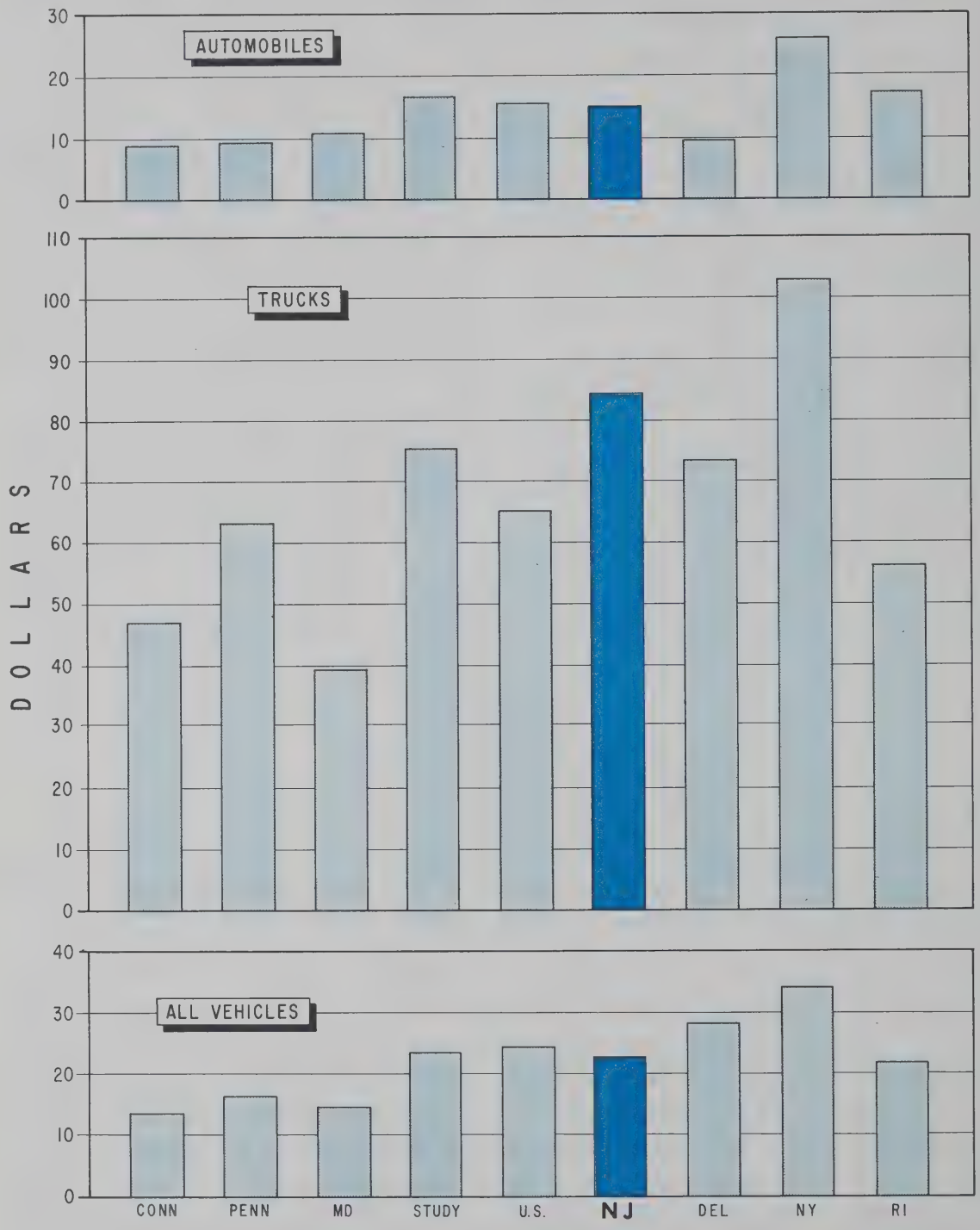
AVERAGE REGISTRATION FEES

New Jersey, Study Area, and the United States

1966

STATE OR AREA	AUTOMOBILES			TRUCKS			ALL VEHICLES		
	Number of Vehicles (in thousands)	Revenue (in thousands)	Average Fee	Number of Vehicles (in thousands)	Revenue (in thousands)	Average Fee	Number of Vehicles (in thousands)	Revenue (in thousands)	Average Fee
New Jersey	2,789	$ 43,153	$15.47	325	$ 27,479	$84.55	3,123	$ 71,181	$22.79
Connecticut	1,324	12,685	9.58	161	7,584	47.11	1,489	20,526	13.79
Delaware	218	4,357	19.99	38	2,783	73.24	256	7,235	28.26
Maryland	1,341	14,740	10.99	186	7,271	39.09	1,534	22,456	14.64
New York	5,514	145,201	26.33	622	64,098	103.05	6,162	210,465	34.15
Pennsylvania	4,545	44,786	9.85	636	40,243	63.28	5,196	85,818	16.52
Rhode Island	376	6,609	17.58	46	2,609	56.72	423	9,296	21.98
Study Area	16,107	271,531	16.86	2,014	152,067	75.50	18,184	426,977	23.48
United States	78,354	1,250,696	15.96	15,517	1,012,825	65.27	94,193	2,284,741	24.26

SOURCE: United States Department of Transportation, Federal Highway Administration, Bureau of Public Roads, *Highway Statistics, 1966,* Tables MV-1 and MV-2.



AVERAGE REGISTRATION FEES

NEW JERSEY, STUDY AREA, AND THE UNITED STATES

1966

Wilbur Smith and Associates

FIGURE 16

revenues are included in the total. Comparisons are made for automobiles, trucks, and all vehicles.

The average fee for automobiles in New Jersey is $15.47 compared to a low of $9.58 in Connecticut and a high of $26.33 in New York. The fee in New Jersey is somewhat lower than the average for the study area and for the nation.

For trucks, the average fee in New Jersey is $84.55, or next to the highest charge of $103.05 in New York. The lowest fee among the states is $39.09 in Maryland. The averages for the United States and the study area are $65.27 and $75.50, respectively.

For all vehicles, the New Jersey charge of $22.79 is third from the highest of $34.15 in New York. The lowest average fee was $13.79 in Connecticut. Averages for the study area and the nation were $23.48 and $24.26, respectively. It should be noted that New Jersey is below both the study area and national averages.

Number of Vehicles Per Mile of Road

The high demand for travel on New Jersey's highways is shown in Table 40 in comparison with other states in the study area and the average of the nation for the years 1955-1966.

With over 94 registered vehicles for each mile of travelway on all systems, New Jersey showed the greatest concentration of any state or area compared. Connecticut and Rhode Island also showed high density of vehicles in relation to total mileage of highways, roads, and streets. The study area had an average of 60.5 vehicles per mile, and the average for the United States was 25.5 in 1966.

Vehicle density has steadily increased in each state or area since 1955. While increased numbers of vehicles are creating rising demands for more highway facilities, the data indicate that proportionately more vehicles are available to produce additional revenues required. This

TABLE 40

NUMBER OF MOTOR VEHICLES PER MILE OF ROAD

New Jersey, Study Area, and the United States

1955-1966

YEAR	NEW JERSEY	CONNECTICUT	DELAWARE	MARYLAND	NEW YORK	PENNSYLVANIA	RHODE ISLAND	STUDY AREA	UNITED STATES
1955	70.9	59.0	34.8	46.5	44.5	35.2	74.3	45.0	18.4
1956	72.6	61.3	36.5	48.5	45.7	36.5	73.5	46.4	19.0
1957	73.8	63.5	37.7	49.1	45.3	37.0	76.9	46.7	19.4
1958	76.9	62.7	38.4	48.2	46.2	37.4	77.6	47.4	19.6
1959	74.4	63.5	39.8	50.0	47.3	38.4	79.3	48.3	20.3
1960	77.1	66.2	41.5	51.8	47.6	39.2	81.1	47.8	20.8
1961	78.4	67.6	42.8	52.5	48.6	40.0	79.7	50.5	21.2
1962	80.7	70.2	44.6	55.2	50.1	40.8	82.0	51.9	21.9
1963	84.7	73.8	46.8	57.6	54.7	42.0	82.9	54.9	22.8
1964	88.3	77.0	49.2	60.4	56.3	43.4	86.4	56.9	23.6
1965	91.8	80.0	51.0	59.1	57.6	44.5	87.5	58.2	24.5
1966	94.2	83.4	53.2	60.6	60.3	46.0	90.9	60.5	25.5

SOURCE: United States Department of Transportation, Bureau of Public Roads, *Highway Statistics, respective years,* Tables MV-1 and M-1. Excludes motorcycles.

tends to offset at least some of the increased unit costs of providing facilities.

Registration Revenues — Revenues from motor vehicle registration fees and related taxes are definitely classified as motor-user tax revenues and must be considered in highway fiscal analysis, even though they are credited to the general fund of the state. These revenues include collections of motor vehicle registration fees, duplicate certificates, transfers, certificates of ownership, vehicle inspection fees, motor carrier road taxes, and other miscellaneous charges. In New Jersey, other taxes and fees are collected by the Motor Vehicle Division as shown in Table 42, but these funds are not included in the analysis of potential highway revenues.

Table 41 shows revenues from these sources from 1960 through 1966, along with collection expenses and net revenues. Total revenues have increased during the period from $75,124,689 to $103,574,383, while collection expenses increased from $10,248,884 to $15,841,211. Net revenues increased from $64,875,805 to $87,733,172. In percentages, gross revenues increased 38 per cent; expenses, 55 per cent; and net revenues, 35 per cent. As a percentage of gross revenues collection, expenses varied between 13.0 per cent in 1961 to 16.3 per cent in 1965, and averaged 15.2 per cent for the 7 years. On a per vehicle basis, gross revenues varied between $30.96 and $33.08, and averaged $31.85 per registered vehicle, not including motorcycles.

TABLE 41

REVENUES AND EXPENSES
DIVISION OF MOTOR VEHICLES
New Jersey
1960-1966

YEAR	GROSS REVENUES[1]	ADMINISTRATION EXPENSES[2]	COLLECTION EXPENSE AS PER CENT OF GROSS REVENUES	NET REVENUES
1960	$ 75,124,689	$10,248,884	13.6	$64,875,805
1961	78,436,463	10,215,699	13.0	68,220,764
1962	81,064,084	13,043,313	16.1	68,020,771
1963	86,432,712	13,691,417	15.8	72,741,295
1964	93,145,258	14,691,746	15.8	78,453,512
1965	96,661,143	15,746,477	16.3	80,914,666
1966	103,574,383	15,841,211	15.3	87,733,172
PER CENT INCREASE 1960-1966	38	55	—	35

[1]Includes all revenues collected by the Division of Motor Vehicles. Not all of these revenues are considered in subsequent analyses of potential highway funds.

[2]Includes administrative costs, enforcement and inspection.

SOURCE: Revenues from the State of New Jersey, Department of Law and Public Safety, Division of Motor Vehicles, *Comparative Annual Revenue Report.* Collection expenses from Bureau of Public Roads Form 531 submitted by New Jersey Department of Transportation.

An analysis of motor vehicle revenues is shown in Table 42 for 1966. Of the total $103,574,383 collected, $73,477,541 was from registration fees; $1,976,343 from motor carrier road taxes; and $7,846,601 from various fees and taxes closely related to vehicles. Drivers' licenses and related receipts accounted for $11,475,747. The remainder of $8,798,151 was from fines, unsatisfied judgment funds, sales and use taxes, excise taxes, and miscellaneous collections.

In New Jersey, responsibilities of the Motor Vehicle Division are quite varied, extending, in addition to licensing, to driver control, enforcement, vehicle inspection, collection of motor carrier road taxes, traffic safety, and administration of the motor vehicle responsibility law and unsatisfied judgment claims. To analyze relative costs of these activities, Table 43 is presented from the 1967 budget showing appropriations for each operation and the percentages of total costs. The largest cost for a single activity is $4,994,239, or 35.0 per cent for the Vehicle Inspection Bureau. The next largest item is $3,970,535, or 27.8 per cent for the Licensing Bureau. A total of 9.5 per cent of the appropriation is for the Security Responsibility Bureau and the Unsatisfied Claim and Judgment Fund Board.

Motor Fuel Taxes, Consumption, and Revenues

As in most states, taxes on motor fuel constitute one of the most important sources of

TABLE 42

ANALYSIS OF DIVISION OF MOTOR VEHICLE REVENUES

New Jersey

1966

REVENUE SOURCE	*REVENUE*		*PER CENT OF TOTAL*
Registration Fees and Related Revenues:			
Motor Vehicle Registrations	$73,477,541		70.9
Motor Carrier Road Tax	1,976,343		1.9
Miscellaneous Motor Vehicle Fees[1]	7,846,601		7.6
Subtotal		$ 83,300,485	80.4
Fines		3,421,891	3.3
Unsatisfied Claims and Judgment Fund		2,235,846	2.2
Sales and Use Taxes (1/2 year)		2,384,238	2.3
Excise Taxes		311,016	0.3
Drivers' Licenses and Related Fees		11,475,747	11.1
Vehicle Inspection Fees		422,059	0.4
Miscellaneous Revenues[2]		23,101	[3]
TOTAL REVENUES		$103,574,383	100.0

[1]Includes Duplicate Certificates, Transfers, Duplicate Plates, Certificates of Ownership, Temporary Plates, Temporary Permits, Convention and Pageant Plates, Certified Copies, Commercial Permits, Courtesy Plates, and Dealers' Temporary Permits.

[2]Includes Junkyard Section Revenues, Race Track Revenues, and Service of Process Fees, and Miscellaneous Receipts.

[3]Less than 0.05 per cent.

SOURCE: The State of New Jersey, Department of Law and Public Safety, Division of Motor Vehicles, *Comparative Annual Revenue Report, 1965-1966.*

TABLE 43

OPERATING EXPENSES BY BUREAU ACTIVITIES

Division of Motor Vehicles

New Jersey

1967

	APPROPRIATION	PER CENT
Executive and Administrative	$ 569,831	4.0
Driver Control	531,373	3.7
Enforcement — Enforcement Bureau	1,833,078	12.8
Enforcement — Vehicle Inspection Bureau	4,994,239	35.0
Licensing	3,970,535	27.8
Traffic Safety	659,281	4.6
Motor Carriers Road Tax	370,390	2.6
Subtotal	12,928,727	90.5
Security Responsibility Bureau	1,066,992	7.5
Unsatisfied Claim and Judgment Fund Board	283,724	2.0
TOTAL	$14,279,443	100.0

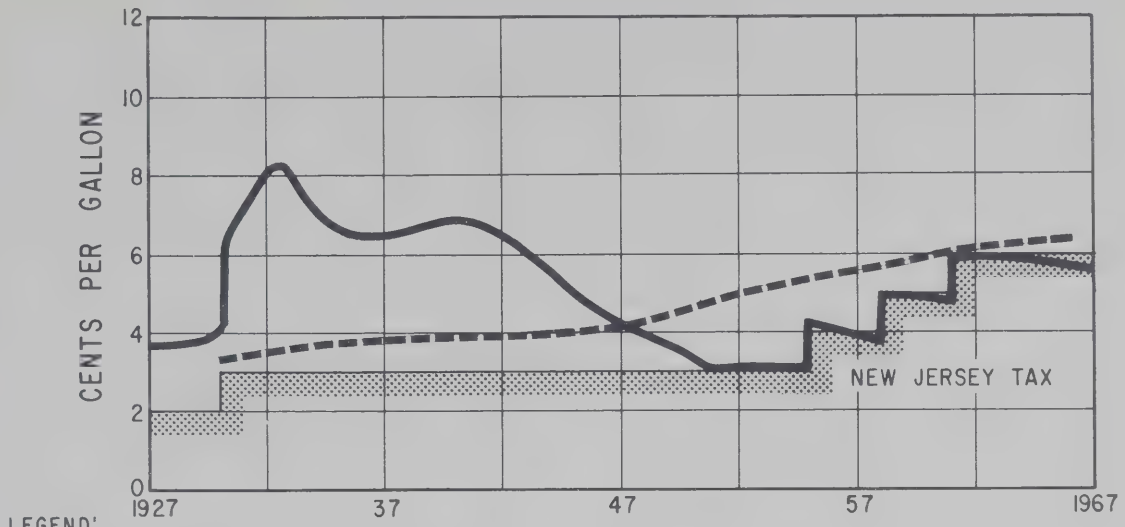
SOURCE: *Budget Message of Richard J. Hughes, Governor of New Jersey,* for fiscal year ending June 30, 1968, February 14, 1967, Trenton, New Jersey.

revenue. In New Jersey in 1966, this tax produced over 22 per cent of state general revenues from all sources.

Tax Rates — The motor fuel tax was first imposed in New Jersey in 1927 at the rate of 2 cents per gallon. Subsequently, the tax was increased to 3 cents in 1930, 4 cents in 1954, 5 cents in 1958, and finally 6 cents in 1961. Figure 17 shows the historical trend in the tax rate and the weighted average rate in the United States for the years 1927 to 1967. The average rate for all fuels in all states increased during the period from 3.35 cents in 1930 to 6.42 cents as of January 1, 1967. It is significant that the rate in New Jersey has never been as high as the United States average.

By comparison, as of January 1, 1968, 47 states and the District of Columbia imposed a tax rate of 6 cents or more on gasoline. The highest rates in the nation are 9 cents in the State of Washington, and 8 cents in Alaska. Thirty-four states and the District of Columbia have rates varying from 6.5 cents to 7.5 cents per gallon, 10 states have a 6 cents rate, and 4 states levy 5 cents per gallon. Tax rates for each state are shown in Figure 18. Ten states have effected rate increases since the beginning of 1967. One state (Idaho) passed a temporary increase for calendar years 1968 and 1969.

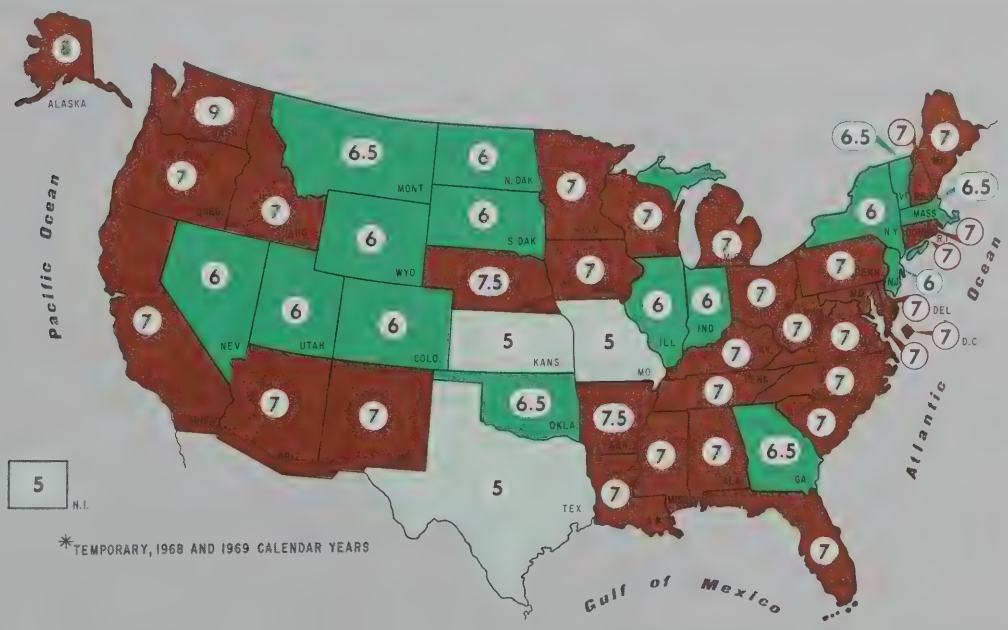
In New Jersey, diesel fuel and other special fuels such as liquefied petroleum gases (LPG) are taxed at the same rate as gasoline. A number of states tax diesel fuel at rates from 1 to 3 cents higher than the prevailing rate for gasoline. Justification for this is the higher energy content of diesel fuel and the more efficient performance in terms of miles per gallon of fuel consumed when used in engines designed for these lower grade fuels. Liquefied gases generally have a lower energy content than gasoline, but most states tax them at the



MOTOR FUEL TAX RATES IN CURRENT AND CONSTANT DOLLARS
NEW JERSEY AND THE UNITED STATES
1927-1967

Wilbur Smith and Associates

FIGURE 17



STATE GASOLINE TAX RATES
JANUARY 1, 1968

Wilbur Smith and Associates

FIGURE 18

same rate as gasoline; none tax them at a lesser rate than gasoline.

Nationally, special fuels accounted for 6.1 per cent of total motor fuel sales in 1966. Six years earlier, the percentage of special fuels was less than 4 per cent. Tax rates on gasoline and special fuels in New Jersey and adjoining states are compared in Table 44. Only one state levies a tax differential on LPG and diesel fuel.

It is interesting to observe the trend in motor fuel tax rates in New Jersey in relation to historical trend in the purchasing power of the dollar based on the wholesale price index, as shown in Figure 17. The graph shows the trend in motor fuel tax rates in New Jersey in terms of current dollars and constant dollars having a value of unity, or 100 per cent, in 1957-1959.

Changes in the value of goods and services are manifested in changes in purchasing power of the dollar, due to the inverse relationship between price levels and the value of money. Economic depressions and booms occur when these changes reach proportions which are generally felt in everyday economic life. Historically, price levels have tended to move upward over the long term, but have been interspersed with shorter periods of inflation or deflation.

Because of inflationary trends, the purchasing power of a 6-cent tax imposed in 1967 is less than that of the 3-cent tax between 1930 and 1943. The peak of purchasing power was obtained in 1933, at which time the 3-cent tax was equal to about 8.2 cents in 1967. And, as the trends show, the value of the dollar continues to decline. Six cents measured by 1957-1959 price levels was equal to only 5.4 cents in 1966.

In mid-1966, the purchasing power of the 6-cent tax for highway construction purposes was equivalent to about 2.2 cents in 1940, or 4.9 cents in 1960.[2] There has recently been a sharp increase in construction costs which will affect the purchasing power even more than noted above.

Therefore, the relative purchasing power of the 6-cent tax is presently reduced, whether measured by the general inflationary trends as reflected in the wholesale price index or by the amount of construction that can be provided at current prices.

Consumption — Total motor fuel consumption in New Jersey and the nation has steadily increased, and it does not appear that this trend will be abated in the near future. Long-term trends in total highway consumption and annual consumption per vehicle are depicted in Figure 19 for 1935 through 1966, and projected to 1986. Since 1935, total highway use of fuel increased by about four times and use per vehicle varied between approximately 700 and 860 gallons per vehicle, excluding the World War II years.

Steady increases in total fuel consumption have been due to increases in motor vehicle registrations, although slightly influenced by increased use per vehicle. Between 1956 and 1966, average annual use per vehicle varied between a high of 860 gallons and a low of 801 gallons, the general trend being slightly upward. Total

TABLE 44

GASOLINE AND SPECIAL FUELS

Tax Rates in New Jersey and Nearby States

January 1, 1968

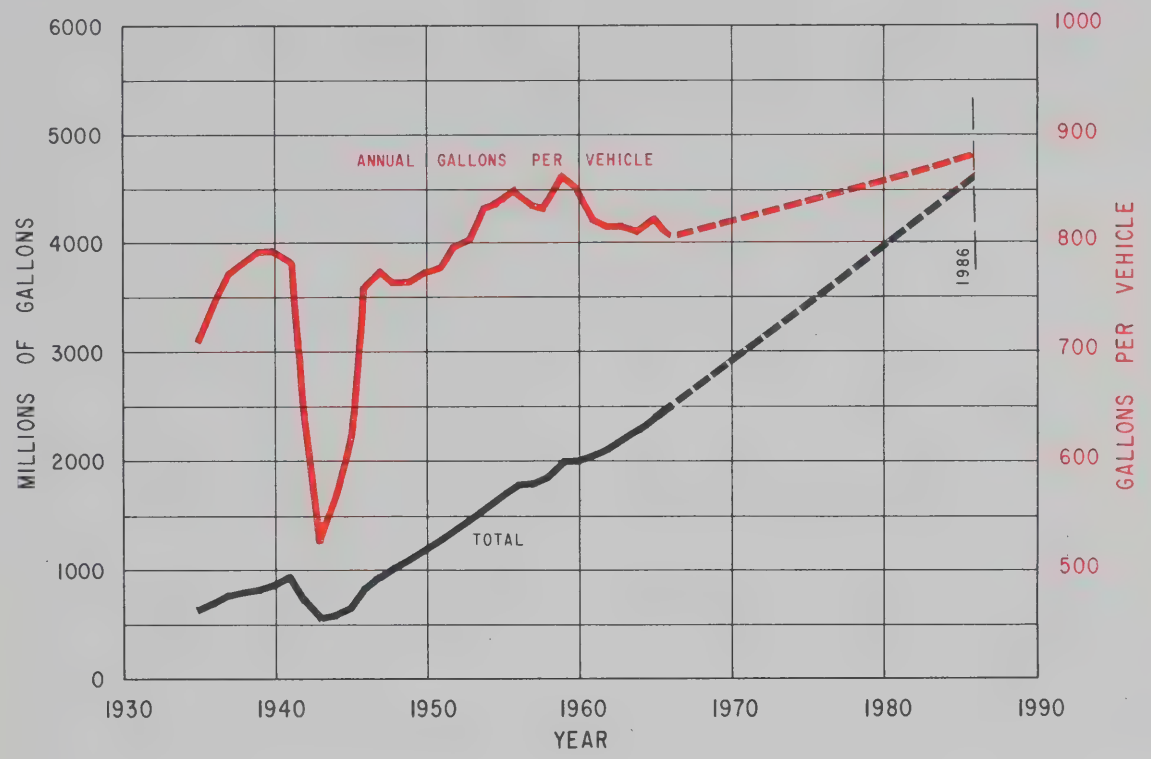
STATE	TYPE FUEL	
	Gasoline	*Special Fuels*[1]
New Jersey	6.0	6.0
Connecticut	7.0	7.0
Delaware	7.0	7.0
Maryland	7.0	7.0
New York	6.0	9.0[2]
Pennsylvania	7.0	7.0
Rhode Island	7.0	7.0

[1]Liquefied petroleum gases (LPG) and diesel types.

[2]Liquefied petroleum gases (LPG) taxed at 6 cents per gallon.

SOURCE: National Highway Users Conference, Washington, D. C. *Registration Fees and Special Taxes*, Service No. 2.

[2]*Highway Statistics*, 1965, "Price Trends for Federal-Aid Highway Construction," Department of Transportation, Bureau of Public Roads.



ANNUAL MOTOR FUEL CONSUMPTION FOR HIGHWAY USE
NEW JERSEY
1935-1966, PROJECTED TO 1986

Wilbur Smith and Associates

FIGURE 19

annual consumption for the period increased steadily from 1,792 million gallons to 2,507 million gallons, an increase of almost 40 per cent.

Of particular interest is the trend in use of special fuels (diesel and liquefied petroleum gases) compared to that of gasoline. In 1956, approximately 56 million gallons of special fuels and 1,812 million gallons of gasoline were taxed; special fuels accounting for 3 per cent of total sales. In 1966, taxed fuels were 2,392 million gallons of gasoline and 177 million gallons of special fuels (6.8 per cent).

Based on projections of motor vehicles and estimated use of 877 gallons of fuel per vehicle annually, total consumption of motor fuel in New Jersey should equal 4,631 million gallons in 1986.

Trends in use of motor fuel for highway travel in New Jersey are compared with study area states and the United States for 1955-1966 in Table 45.

The growth rate for the 12-year period in these states varied considerably. In Rhode Island, the growth was 28.6 per cent, the lowest among the states. The greatest growth oc-

TABLE 45

HIGHWAY USE OF MOTOR FUEL

New Jersey, Study Area, and the United States

1955-1966

YEAR	STATE OR AREA								
	New Jersey	Connecticut	Delaware	Maryland	New York	Pennsylvania	Rhode Island	Study Area	United States[1]
	(millions of gallons)								
1955	1,726	665	132	717	3,227	2,753	227	9,447	47,731
1956	1,792	686	144	788	3,399	2,892	230	9,931	50,214
1957	1,802	717	156	796	3,529	3,008	238	10,246	51,864
1958	1,857	733	158	825	3,613	3,068	242	10,496	53,418
1959	1,984	765	170	876	3,744	3,108	246	10,893	56,157
1960	2,031	790	171	912	3,811	3,239	248	11,202	57,693
1961	2,063	808	191	943	3,880	3,199	251	11,335	59,112
1962	2,111	851	189	1,004	4,051	3,305	256	11,767	61,494
1963	2,219	893	202	1,068	4,184	3,387	265	12,218	64,306
1964	2,307	952	205	1,132	4,387	3,529	272	12,784	67,678
1965	2,439	1,000	216	1,188	4,533	3,671	282	13,329	70,861
1966	2,475	1,043	225	1,264	4,703	3,796	292	13,798	74,374
Per Cent Increase									
1955-1966	43.4	56.8	70.5	76.3	45.7	37.9	28.6	46.1	55.8
1960-1966	21.9	32.0	31.6	38.6	23.4	17.2	17.7	23.2	28.9

[1]Forty-eight states and the District of Columbia.

SOURCE: United States Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Tables G-21 and MF-21, respective years.

curred in Maryland, where highway use of fuel increased 76.3 per cent during the 12 years. Growth in New Jersey was 43.4 per cent, and 46.1 per cent for the study area. In the United States, highway use of fuel increased 55.8 per cent.

Growth rates for the 7-year period, 1960-1966, showed a somewhat different pattern. The smallest growth of 17.2 per cent occurred in Pennsylvania, but Rhode Island had a growth only slightly greater. The highest 7-year growth occurred in Maryland. Growth in New Jersey was 21.9 per cent; in the study area, 23.2 per cent; and in the United States, 28.9 per cent. Over 74 billion gallons of motor fuel were used on the highways of the nation in 1966.

Revenues — Revenues from motor fuel taxes and miscellaneous sources are shown in Table 46 for fiscal years 1961-1966. Agricultural and other refunds for off-highway use and costs of administration are deducted from gross revenue to obtain net revenues. The totals include revenues from fuel and use taxes, dealers' licenses, fines, penalties, and interest.

Gross revenues increased from $105,119,401 in 1961, to $151,459,693 in 1966, while net revenues increased from $99,694,913 to $144,655,033, indicating growths of 44 per cent and 45 per cent, respectively. Refunds have varied in a narrow range and have averaged 4.4 per cent; costs for administering the motor fuel acts are low and have decreased slightly during the 6 years, averaging 0.39 per cent of the gross revenues.

Highway Financing by the State

The effectiveness of state highway financing depends on the adequacy of funds and the manner of their application. It is necessary to examine the means used by the State of New Jersey in financing its highways, roads, and streets and to analyze annual amounts of revenues made available in recent years for state highways.

There are three principal sources of state highway funds. First are moneys provided by appropriations by the State Legislature. The second source is federal aid for highways ad-

TABLE 46

MOTOR FUEL TAX REVENUES

New Jersey

1961-1966

FISCAL YEAR	*GROSS REVENUE*[1]	*REFUNDS*	*COST OF ADMINISTRATION*	*NET REVENUE*
1961	$105,119,401[2]	$4,919,641	$504,847	$ 99,694,913
1962	128,794,067	6,227,616	516,319	122,050,132
1963	132,647,135	5,666,430	516,916	126,463,789
1964	138,611,736	6,397,026	559,763	131,654,947
1965	143,785,555	6,096,874	515,187	137,173,494
1966	151,459,693	6,277,988	526,672	144,655,033

[1]Includes miscellaneous revenues from license fees, fines, penalties, and interest.

[2]Tax rate increased to 6 cents per gallon June 1, 1961 (Chapter 37, P. L. 1961).

SOURCE: State of New Jersey, Department of the Treasury, Division of Taxation, *Report of the Motor Fuels Tax Bureau,* fiscal year ending June 30, 1966, and other years.

ministered by the U. S. Department of Transportation, Bureau of Public Roads.

Bond financing is the third major source of funds, but has not been significant in financing construction on the State Highway System. Prior to 1956, New Jersey sold several relatively small issues of State Highway Construction Bonds. The last of these bonds, Series G, was sold in 1955, and the final payment is scheduled for 1990. The bonds outstanding at the end of 1966 were less than $14,000,000.

Legislative Appropriations — New Jersey finances its State Highway System through annual appropriations by the Legislature from the general funds of the state treasury, and through the moneys received from federal-aid highway apportionments. Article VIII, Section II, Paragraph 2, of the Constitution of New Jersey, adopted in 1947, requires that all expenditures be made by legislative appropriation and that appropriations shall not be made unless revenue on hand and anticipated for the fiscal period is sufficient to cover the appropriation.

New Jersey is one of five states that follows the policy of financing its highways from general fund appropriations. The other states are Alaska, Delaware, New York, and Rhode Island. State financing in Georgia is conducted through general fund appropriations with a significant exception. The constitution requires that annual appropriations for highways shall be at least as much as net collections of motor fuel tax revenues during the preceding year, a provision which is in effect a dedication of revenue to a specific purpose.

Each of the 44 remaining states has adopted a policy of earmarking all, or a substantial share, of the funds collected from motor fuel taxes, registration fees, drivers' licenses, and similar charges for highway purposes, based on the theory that revenues derived from levies against the highway users should be used to defray the costs of highways.

A study of the organizational structure of the Department of Transportation provides the best means of understanding the categories for which its funds are made available.

The Department of Transportation is charged with four major programs in support of transportation services for the state. These programs are:

1. Construction of a primary state highway system.
2. Maintenance of the state highway system.
3. Assisting counties and municipalities in the repair and construction of local roads and bridges.
4. Foster efficient and economic public transportation service including improvement of the commuter railroad system.

Management of the Department is vested in the commissioner. Basic administrative services are provided by the office of the Director of Administration. The office of the Director of Planning assists the Commissioner in analyzing transportation needs of the state and making recommendations for master planning to support such needs.

The construction, maintenance, and local government aid programs are centered in the office of the Assistant Commissioner for Highways and the public transportation program is directed by the Assistant Commissioner for Public Transportation.

The budget message of Governor Hughes for the fiscal year ending June 30, 1968, showed available appropriations for fiscal 1967 for the four programs plus management costs of the Department as follows:

Management of the Department	$ 5,233,319
Construction of State Highway System	338,474,466
Maintenance of State Highway System	26,908,527
Improvement of Local Road System	57,995,027
Public Transportation Services	17,347,730
TOTAL	$445,959,069

The sources of revenue for meeting program expenditures were obtained from:

State General Fund Appropriations	$158,599,242
Prior Appropriation Balances (state and federal)	176,125,496
Federal Aid	
Primary and Urban Systems	16,871,922
Interstate System	88,873,518
Secondary System	1,989,893
Beautification Act	1,509,105
Local Governments	1,989,893
TOTAL	$445,959,069

Insofar as the highway function is concerned, the budget items are straightforward. The state-aid to local governments program, however, deserves further discussion.

Local Government Aid — The Division of Local Government Aid receives an appropriation for its administrative costs in handling the state grants to counties and municipalities for highways.

The county appropriation totals $8,000,000 of which $6,000,000 is distributed to counties based on a formula of one third population, one third area, and one third county road mileage. The balance of $2,000,000 is distributed on the basis of equal weights of population and county road mileage. There is also a flat grant of $55,000 per county, for a total of $1,155,000.

The grants to municipalities currently total $4,500,000, which is distributed to municipalities based on a formula of one half for population and one half for municipal road mileage modified. There is a further flat grant of $100,000 per county, or a total of $2,100,000 for municipal roads.

There is also an aid program for counties and municipalities for lighting streets and highways. The amounts vary every year, and range from a low of $210,000 for fiscal years 1958 and 1959, to a high of $411,000 for fiscal year 1964.

For the last 2 fiscal years, special grants of $200,000 per year have been made to defray the costs of rebuilding county or municipal roads damaged by vehicles of 40,000 pounds or more that bear registration plates marked "constructor."

In the budget for the fiscal year ending June 30, 1967, two special grants for state aid were authorized:

Extraordinary state aid for county highways, with the share of each county to be calculated on the basis of the average of the following two percentages:

1. The percentage of population of such county to the total population of the state; and
2. The percentage of total county road mileage within such county to the total county road mileage in the state — $20,000,000.

Extraordinary state aid for municipal highways, with the share of each municipality to be calculated on the basis of the average of the following two percentages:

1. The percentages of population of such municipality to the total population of the state; and
2. The percentage of total municipal road mileage within such municipality to the total municipal road mileage in the state — $14,000,000.

These two appropriations more than doubled the total appropriation grant to counties and municipalities in any recent fiscal year.

At the end of a fiscal year, any highway funds that have not been obligated or disbursed automatically lapse. It is customary, however, for the State Legislature to insert a clause in the appropriations act directing that the unexpended balance at the end of the prior fiscal year "is hereby appropriated." Thus, fund balances can be carried over from year to year.

State Funds Available for the New Jersey Highway Systems

In the Governor's budget messages and in the appropriation acts of the New Jersey State Legislature, the funds for the State Highway Department are listed in three separate sections: General State Operations (executive), State aid, and Capital Construction. To determine the share of funds appropriated for state highway purposes, it is necessary to extract the component items from the budget and regroup them as follows:

1. *State Highway Purposes*
   General Administration of State Highway Department Capital Construction
   Highway Department Installations
   Construction and Right-of-Way Division — Operating Costs
   State Highway Projects
2. *Debt Service on Highway Construction Bonds*
   Interest
   Principal
3. *Bureau of Railroad Transportation*
4. *State Aid to Counties and Municipalities*
   Administrative Costs
   Aid to Counties
   Aid to Municipalities
   Grants for Lighting
   Special Grants

Amounts appropriated to the Department of Transportation for highways are in accordance with the four general purposes listed. (Certain adjustments are made to reflect funds transferred between the highway funds and the Bureau of Railroad Transportation.) A brief explanation should clarify the nature of each of these four categories.

State Highway Purposes — Funds appropriated for state highway purposes cover all maintenance, administrative, and general costs of the Department of Transportation (exclusive of the Division of Local Government Aid and Bureau of Railroad Transportation) plus the capital outlay for the State Highway System and highway department installations.

A detailed tabulation of appropriations for state highway purposes from 1957-1968 is shown in Table 47. Amounts are indicated for administration, highway department installations, and construction of state highways. Amounts available for construction are reduced by transfers from highway funds to the Bureau of Railroad Transportation, as discussed later. Since 1957, total appropriations have varied between approximately, $40,000,000 and $90,000,000. The net total, after transfers for 1968, is $88,652,730. Almost $62,000,000 of this is for construction work on the State Highway System. The appropriation for administration and general activities is $26,290,184, and $2,162,000 is for installation.

Debt Service — Debt service, in the form of principal and interest, on outstanding highway construction bonds must be paid annually under the terms of bond indentures. The annual debt service obligations were relatively constant (about $2,900,000) from 1957 through 1966. In 1966, the final payment was made on one of the issues, so in 1967 debt service requirements totaled only $1,800,000. Further reductions will occur in 1968 when debt service costs will be less than $1,000,000. After 1968, the amounts needed to meet principal and interest payments will be less than $1,000,000 per year until 1990, when the last bonds are scheduled to be redeemed.

State Aid — State-aid grants to counties and municipalities administered by the Division of Local Government Aid, averaged about $17,000,000 per year from 1957 through 1966. For 1967, the Legislature supplemented the annual appropriation of $17,000,000 with special fund grants of $20,000,000 to counties and $14,000,000 to municipalities, for a total of $51,000,000. In 1968, the appropriation was approximately $33,000,000.

Bureau of Railroad Transportation — Recognizing the need for maintaining and improving rail commuter service as a vital component in an integrated transport system, the state established a Bureau of Railroad Transportation in 1959 as an operating unit within the former State Highway Department.

Since 1961, the appropriations to the Bureau of Railroad Transportation have been supplemented by a series of fund transfers totaling $13,250,000. All transfers came from funds previously appropriated for state highway purposes, except for $500,000 which was transferred from the Department of Public Utilities as half the cost of a grade crossing elimination on the Camden-Kirkwood Line. (The matching share of $500,000 came from funds marked for state highway purposes and is included in the $13,250,000.) Annual appropriations to the Bureau of Railroad Transportation, listed on

TABLE 47

APPROPRIATIONS BY THE NEW JERSEY STATE LEGISLATURE TO THE NEW JERSEY DEPARTMENT OF TRANSPORTATION FOR STATE HIGHWAY PURPOSES

FOR THE FISCAL YEAR ENDING JUNE 30	ADMINISTRATION AND GENERAL[1]	HIGHWAY DEPARTMENT INSTALLATIONS	CONSTRUCTION OF STATE HIGHWAY SYSTEM					GRAND TOTAL
			Administration, and Construction	State Highway Projects	Subtotal	Transfers — Bureau of Railroad Trans.	Total	
1957	$15,769,434	$265,000	$4,469,183	$21,750,383	$26,219,566	—	$26,219,566	$42,254,000
1958	16,414,132	233,000	4,422,850	18,570,740	22,993,590	—	22,993,590	39,640,722
1959	17,872,464	375,000	4,538,081	36,164,000	40,702,081	—	40,702,081	58,949,545
1960	19,413,577	300,000	3,418,884	38,500,000	41,918,884	—	41,918,884	61,632,461
1961	20,172,992	—	4,198,042	41,000,000	45,198,042	—$6,500,000	38,698,042	58,871,034
1962	20,389,298	121,000	4,620,888	35,150,000	39,770,888	—	39,770,888	60,281,186
1963	21,618,758	745,000	5,466,966	35,020,914	40,487,880	— 3,000,000	37,487,880	59,851,638
1964	22,360,489	267,000	6,015,818	35,663,958	41,679,776	— 1,000,000	40,679,776	63,307,265
1965	24,392,504	455,000	6,712,926	36,333,333	43,046,259	—	43,046,259	67,893,763
1966	21,294,793	479,400	7,865,014	44,413,579	52,278,593	+ 2,550,000[2]	54,828,593	76,602,786
1967	23,507,899	710,000	9,540,341	56,796,611	66,336,952	—	66,336,952	90,554,851
1968	26,290,184	2,162,100	10,393,631[3]	51,306,815	61,700,446	— 1,500,000[4]	60,200,446	88,652,730

[1]Includes appropriations for maintenance.

[2]Includes transfer of $750,000 to the Bureau of Railroad Transportation offset by $3,300,000 of Bureau of Railroad Transportation funds for highway work.

[3]Includes $452,490 to Division of Planning.

[4]Transfer of $500,000 required by appropriation act, an additional $1,000,000 may be transferred at the discretion of the Commissioner.

NOTE: Bureau of Railroad Transportation was established in 1959 and is now in the office of the Assistant Commissioner for Public Transportation, Division of Public Transportation.

SOURCE: 1957-1965 Annual Budget Messages of the Governor; 1966: Chapter 112, Public Laws of 1965.
1967: Chapter 33, Public Laws of 1966.
1968: Senate Bill No. 500 (1967 Legislative Session).

TABLE 48

APPROPRIATIONS BY THE NEW JERSEY STATE LEGISLATURE

For Highways and Rail Commuter Service

1957-1968

FOR THE FISCAL YEAR ENDING JUNE 30	STATE HIGHWAY PURPOSES[1, 2]	DEBT SERVICE	STATE AID TO COUNTIES AND MUNICIPALITIES	BUREAU OF RAILROAD TRANSPORTATION[1]	TOTAL
			(thousands)		
1957	$42,254	$2,889	$17,033	$ —	$ 62,176
1958	39,641	2,870	16,883	—	59,394
1959	58,949	2,864	16,747	50	78,610
1960	61,633	2,872	17,068	200	81,773
1961	58,871	2,886	17,089	7,200[3]	86,046
1962	60,281	2,872	17,095	5,750	85,998
1963	59,852	2,881	16,616	9,000	88,349
1964	63,307	2,886	16,810	9,600	92,603
1965	67,894	2,864	16,944	6,000	93,702
1966	76,603[4]	2,874	17,073	7,950	104,500
1967	90,555	1,830	50,964	15,050	158,399
1968	88,653	953	32,895	25,027	147,528

[1]Adjusted to reflect funds transferred to the Bureau of Railroad Transportation from appropriations for "State Highway Purposes" as follows: 1961, $6,500,000; 1963, $3,000,000; 1964, $1,000,000; 1966, $750,000; and 1968, $1,500,000.

[2]Excludes federal funds.

[3]Includes $500,000 transferred from the Department of Public Utilities for grade crossing elimination on Camden-Kirkwood Line.

[4]Includes $3,300,000 representing highway work involved in the Aldene Plan administered by the Bureau of Railroad Transportation.

SOURCE: 1957-1965 Annual Budget Messages of the Governor;
1966: Chapter 112, Public Laws of 1965;
1967: Chapter 33, Public Laws of 1966;
1968: Senate Bill No. 500 (Legislative Session 1967).

Table 48, have been increased by the amounts of these fund transfers. In 1966, however, the Bureau earmarked $3,300,000 of its own appropriation for highway work in connection with the Aldene Plan.[3] On Table 48 an adjustment was made to include this amount with appropriations for "state highway purposes." Thus, the net amount of nonrepayable funds transferred from highway to railroad purposes was $7,950,000.

Summary of Appropriations — A summary of appropriations by the State Legislature is shown in Table 48 for 1957 through 1968. Included are amounts for state highway purposes, debt service, state aid to counties and

[3]This plan, named for the small station of Aldene in Union County, involves an interconnection of tracks that will permit the passenger trains of the Central Railroad of New Jersey to travel over the Lehigh Valley Railroad tracks into Newark where passengers can transfer to trains for New York City.

municipalities, and the Bureau of Railroad Transportation.

The total for all these activities has varied from almost $60,000,000 to over $158,000,000 in 1967. In that year, a special appropriation was made for state aid, and the amount for railroad purposes was increased above previous levels.

In 1968, the appropriation for state highway purposes was $88,653,000; debt service, $953,000; state aid, $32,895,000; and railroads, $25,027,000 (after transfers from highway funds), making a total of $147,528,000 for all purposes.

Under the *State Aid Road System Act* of 1967, a state-aid road system will be established consisting of county and municipal roads so situated as to form a comprehensive and integrated network of local roads designated to provide connections to and between major traffic arteries, and other residential, recreational, educational, commercial, industrial, and agricultural transportation centers.

It is anticipated that $15,000,000 will be made available annually for this program, from which the state will finance up to 50 per cent of the total cost of projects approved for this system. This will be in addition to current appropriations for state aid.

A comparison of state appropriations for highways and collections of highway-user taxes is shown in Table 49 for the years 1961-1966. Appropriations have varied between 44.2 per cent of net revenues in 1965 and 53.9 per cent in 1961 and have averaged 46.8 per cent for the 6 years.

Highway Financing by Local Governments

In a study of all highways, roads, and streets in New Jersey and methods of financing them, local revenues of counties and municipalities must be considered. These revenues are derived in most jurisdictions principally from local property taxes and special assessments, general

TABLE 49

COMPARISON OF STATE APPROPRIATIONS FOR HIGHWAYS AND HIGHWAY-USER REVENUES

New Jersey

1961-1966

YEAR	NET HIGHWAY-USER REVENUES[1]			STATE APPROPRIATIONS	APPROPRIATIONS AS PER CENT OF TOTAL REVENUES
	Registrations	Motor Fuel	Total		
1961	$ 59,860,115	$ 99,694,913	$ 159,555,028	$ 86,046,000	53.9
1962	62,094,414	122,050,132	184,144,546	85,998,000	46.7
1963	66,905,696	126,463,789	193,369,485	88,349,000	45.7
1964	72,068,601	131,654,947	203,723,548	92,603,000	45.5
1965	74,715,090	137,173,494	211,888,584	93,702,000	44.2
1966	78,037,003	144,655,033	222,692,036	104,500,000	46.9
TOTAL	$413,680,919	$761,692,308	$1,175,373,227	$551,198,000	46.8

[1]Net revenues after deduction of collection expenses.

TABLE 50

LOCAL REVENUES FOR MUNICIPAL STREETS

New Jersey

1960-1965

YEAR	PROPERTY TAXES AND SPECIAL ASSESSMENTS	APPROPRIATIONS	BUS TAX	TOTAL REVENUES[1]
1960	$1,643,296	$62,693,704	$2,261,571	$66,598,571
1961	1,564,831	71,461,229	2,297,978	75,324,038
1962	1,801,204	66,256,388	1,341,711	69,399,303
1963	1,756,340	67,239,229	1,275,368	70,270,937
1964	1,815,771	74,595,296	1,181,766	77,592,833
1965	1,813,074	82,821,603	1,255,504	85,890,181

[1]Includes receipts for allied street functions but does not include revenues or receipts used for parking facilities.

SOURCE: New Jersey Department of Transportation report to the United States Department of Transportation, Bureau of Public Roads, *Local Road and Street Finance Report,* Form PR 535, for respective years.

fund appropriations, and other taxes which might be used for road or street purposes. Revenues include motor vehicle fines when used for roads but do not include parking meter fees used for parking facilities. Costs for the latter are not included in needs, therefore receipts from these operations are excluded from revenues.

In addition to local funds, counties and cities receive state-aid appropriations for financing of roads and streets and have also utilized bond financing in increasing amounts.

Municipal Street Revenues — Local revenues for municipal streets are shown in Table 50 for 1960-1965. During this period, total receipts increased from $66,598,571 to $85,890,181, a gain of 29 per cent. The increase was chiefly from local general fund appropriations. Property taxes and special assessments increased only about 10 per cent and bus taxes decreased almost 50 per cent. In 1965, total receipts from state and local sources amounted to approximately $92,500,000.

Table 51 shows outstanding balances of bonds

TABLE 51

MUNICIPAL STREET BONDS AND NOTES OUTSTANDING

New Jersey

1960-1965

YEAR	BONDS AND NOTES OUTSTANDING AT END OF YEAR	INTEREST PAYMENTS
1960	$55,170,174	$1,779,336
1961	56,740,043	1,708,061
1962	58,316,362	1,784,756
1963	66,521,201	1,782,006
1964	76,012,176	1,952,273
1965	74,606,492	2,173,198

SOURCE: New Jersey Department of Transportation report to the United States Department of Transportation, Bureau of Public Roads, *Local Road and Street Finance Report,* Form 535, for respective years.

and notes and annual interest paid for 1960-1965. The trend in the amount outstanding has been generally upward, with the exception that the amount outstanding decreased slightly from 1964 to 1965, when the balance was $74,606,492. The balance in 1960 was $55,170,174.

Annual interest payments on outstanding debt increased from $1,779,336 in 1960 to $2,173,198 in 1965. Interest is the net cost of credit financing, since proceeds of road issues are eventually offset by principal repayments from current tax sources. Highway costs are increased by the amount of interest payments. This will be discussed more fully when highway needs are compared with available revenues.

County Road Revenues — Local revenues for county roads are derived from local general fund appropriations, ad valorem taxes on property, motor vehicle fines, and other revenues devoted to roads; such as interest on investments and miscellaneous direct grants from the Federal Government. The last three sources named have produced negligible revenue during the 6 years, and no revenues in some years. General fund appropriations composed the greatest portion of the total, $23,405,444 in 1965, an increase from $18,729,502 in 1960. Collection of fines increased from $2,541,996 in 1960 to $3,816,778 in 1965, and in that year accounted for 14 per cent of total revenue of $27,222,222. See Table 52.

New Jersey counties also make extensive use of credit financing as shown in Table 53. Road bonds and notes outstanding increased from $43,087,490 in 1960 to $70,006,804 in 1965, each year showing an increase over the previous one. It followed also that interest costs increased from $1,120,921 in 1960 to $1,807,758 in 1965.

Federal Aid for Highways

Since 1916, the Federal Government has distributed substantial sums among the states for highways. These amounts have increased considerably in recent years because of the accelerated rate of construction caused by the Federal-Aid Highway Act of 1956.

Apportionment of Federal-Aid Highway Funds to New Jersey is shown in Table 54. For

TABLE 52

LOCAL REVENUES FOR COUNTY ROADS

New Jersey

1960-1965

YEAR	APPROPRIATIONS	MOTOR VEHICLE FINES	PROPERTY TAXES	FEDERAL GOVERNMENT[1]	INTEREST	TOTAL
1960	18,729,502	2,541,996	136	—	40,113	21,311,747
1961	16,866,102	2,652,318	38	—	5,080	19,523,538
1962	19,673,083	2,749,703	4,965	240,624	—	22,668,375
1963	22,854,054	3,083,744	49,013	73,227	—	26,060,038
1964	22,972,629	3,373,698	—	34,872	—	26,381,199
1965	23,405,444	3,816,778	—	—	—	27,222,222

[1]Miscellaneous direct payments to counties used for roads. Regular federal-aid highway funds not included.

SOURCE: New Jersey Department of Transportation report to United States Department of Transportation, Bureau of Public Roads, *Local Road and Street Finance Report*, Form PR 535, for respective years.

Federal aid for highways has been a major source of revenue to New Jersey, amounting to $118,000,000 for 1969. These funds are matched by state and local funds with current matching ratios being 90 per cent federal and 10 per cent state for the Interstate System and 50 per cent federal and 50 per cent state or local for the ABC system. Federal taxes on highway users provide the revenue for federal-aid programs.

TABLE 53

ROAD BONDS AND NOTES OUTSTANDING

New Jersey Counties

1960-1965

YEAR	*BONDS AND NOTES OUTSTANDING AT END OF YEAR*	*INTEREST PAYMENTS*
1960	$43,087,490	$1,120,921
1961	50,738,923	1,132,545
1962	56,657,804	1,383,435
1963	59,325,444	1,486,164
1964	64,375,051	1,619,115
1965	70,006,804	1,807,758

SOURCE: New Jersey State Highway Department report to the United States Department of Transportation, Bureau of Public Roads, *Local Road and Street Finance Report*, Form 535, for respective years.

the Interstate System, apportionments are determined by need for funds to complete the system in each state. The amount of Interstate funds apportioned to New Jersey for the fiscal year ending June 30, 1969, was $99,178,575. The apportionment for federal primary and secondary highways is based on formulas which take into account area, population, or post road mileage in each state. Urban fund apportionments are based on the urban population in each state. Apportionments for these highways for 1969 total $19,106,919. Total apportionments to New Jersey in 1968 are $18,895,808 for its federal-aid primary, secondary, and urban highways, and $88,873,518 for the Interstate System.

The federal-aid secondary program in New Jersey is administered by the Division of Local Government Aid within the Department of Transportation. Of approximately 2,200 miles of federal-aid secondary roads in New Jersey, about 94 per cent are under county jurisdiction. Some projects on this system are financed 50 per cent from federal funds and 50 per cent from matching funds provided by the state or counties. (The major share of matching funds comes from counties.)

TABLE 54

APPORTIONMENTS OF FEDERAL-AID HIGHWAY FUNDS

New Jersey

1957-1969

FEDERAL FUNDS APPORTIONED (fiscal year)	PRIMARY	SECONDARY	URBAN	SUBTOTAL	INTERSTATE	TOTAL
1957	$ 4,081,077	$ 1,369,283	$ 7,592,209	$ 13,042,569	$ 3,759,671	$ 16,802,240
1957[1]	746,588	252,837	1,375,976	2,375,401	21,903,382	24,278,783
1958[2]	6,076,929	1,719,295	8,356,506	16,152,730	37,235,749	53,388,479
1959[3]	6,198,993	1,747,245	8,563,453	16,509,691	43,533,500	60,043,191
1959[1]	—	—	—	[4]	4,375,226	4,375,226
1960	5,488,333	1,904,658	9,857,490	17,250,481	80,495,500	97,745,981
1961	4,628,033	1,889,329	9,824,877	16,342,239	57,665,520	74,007,759
1962	4,904,496	2,006,565	9,668,607	16,579,668	70,079,625	86,659,293
1963	6,127,534	2,180,663	9,959,813	18,268,010	62,402,100	80,670,110
1964	5,962,020	2,044,966	10,190,574	18,197,560	67,602,275	85,799,835
1965	6,166,540	2,140,434	10,405,791	18,712,765	69,846,907	88,559,672
1966	6,016,770	1,981,060	10,769,268	18,767,098	72,802,450	91,569,548
1967	6,023,416	1,989,893	10,742,004	18,755,313	78,100,650	96,855,963
1968	6,086,295	2,023,886	10,785,627	18,895,808	88,873,518	107,769,326
1969	6,221,344	2,116,307	10,769,268	19,106,919	99,178,575	118,285,494

[1]Additional funds apportioned.

[2]Includes transfer of $1,000,129 from Urban to Primary Funds.

[3]Includes transfer of $1,020,218 from Urban to Primary Funds.

[4]This table does not include special ("D") funds of $7,500,000 authorized for fiscal year 1959 and loans of $3,000,000 in ("L") funds made to match the special funds. These loans were, in effect, repaid by reductions from subsequent appropriations.

SOURCE: United States Department of Commerce, Bureau of Public Roads; Highway Statistics, Table FA-4 and press releases.

Federal-aid secondary funds are distributed to each county on a request basis. When requests exceed available funds, a formula is used to ensure equitable distribution. Priorities in making grants of funds are based on the formula.

Toll Facilities

New Jersey is served by three toll road facilities: the New Jersey Turnpike, Garden State Parkway, and Atlantic City Expressway.

In 1948, due to demanding north-south traffic needs, the New Jersey Legislature created the New Jersey Turnpike Authority to "construct, maintain, repair, and operate" specific toll road projects. The Turnpike Authority, through issuance of $235,000,000 in bonds, constructed the 118-mile New Jersey Turnpike which has been in operation since 1952. At later dates, additional bonds were issued by the Turnpike Authority for additions and improvements and more issues are programmed for the future.

The quick acceptance by motorists and financial success of the New Jersey Turnpike encouraged the State Legislature to authorize construction of the Garden State Parkway. This 173-mile toll facility was financed by issuance of $285,000,000 in bonds and fully completed in 1956. Like the New Jersey Turnpike, there have been additions and improvements to the Parkway, with total debt, as of December 13, 1965, being $355,300,000.

The newest toll facility was created in 1962 when the New Jersey Expressway Authority was created to build the 44-mile Atlantic City Expressway. This toll facility was completely opened to traffic in 1965, being financed by a $53,000,000 bond issue.

All bonds issued by the various toll road authorities are secured by tolls and receipts of the respective facilities, except for the original issue of the Garden State Parkway which is further secured by the "full faith and credit" of the state.

In addition to the three toll roads that cross the state, there are numerous toll crossing facilities widespread over the state. These facilities are under the jurisdiction of the following authorities and commissions: The Port of New York Authority, Delaware River Port Authority, Delaware River Joint Toll Bridge Commission, Delaware River and Bay Authority, Burlington County Bridge Commission, and Cape May Bridge Commission.

Although all toll facilities are important to the movement of traffic and goods within and across New Jersey, they have not been included in this study. Financing from public funds is not anticipated since toll revenues are expected to be adequate for debt service, maintenance, and operation costs.

Palisades Interstate Parkway

This facility was originally constructed by the New Jersey State Highway Department but is operated by and completely under the jurisdiction of the Palisades Interstate Parkway Commission. The total length of the Parkway is approximately 11 miles, paralleling the Hudson River between the George Washington Bridge and the New York-New Jersey state line.

Summary of Highway Financing in New Jersey

The statewide system of highways, roads, and streets in New Jersey is financed by a joint effort of the state, federal, and local governments. Due to the large apportionments for the Interstate System, federal funds in each year since 1958 have constituted the largest single source of highway revenues.

To show a trend in total receipts, a summary of revenues is given in Table 55 for 1960-1966. County and municipal revenues are estimated for 1966, since these records have been completed only through 1965. The figures are regularly compiled by the Department by analyzing records of each unit of local government — a total of 588. Reports for each county and municipality show receipts and disbursements from local tax sources for roads and streets and status of debt incurred for these activities.

TABLE 55

SUMMARY OF REVENUES FOR ALL HIGHWAYS, ROADS, AND STREETS

By Source of Revenue

New Jersey

1960-1965

YEAR	REVENUES				
	State[1]	*Federal*[2]	*Counties*	*Municipalities*	*Total*
1960	$ 81,773,000	$ 17,250,000	$ 21,312,000	$ 66,599,000	$186,934,000
1961	86,046,000	16,342,000	19,524,000	75,324,000	197,236,000
1962	85,998,000	16,580,000	22,668,000	69,399,000	194,645,000
1963	88,349,000	18,268,000	26,060,000	70,271,000	202,948,000
1964	92,603,000	18,198,000	26,381,000	77,593,000	214,775,000
1965	93,702,000	18,713,000	27,222,000	85,890,000	225,527,000
1966	104,500,000	18,767,000	27,997,000[3]	89,086,000[3]	240,350,000

[1]Includes appropriations for state highway purposes, debt service, state aid to counties and municipalities, and railroad transportation services.

[2]Federal aid Interstate funds are treated separately and are not included in these figures. Apportionments for 1967, 1968, and 1969 totaled $78,100,650, $88,823,518, and $99,178,575, respectively.

[3]Estimated.

To properly analyze present and future revenues and needs, revenues are summarized by tax source and by systems on which moneys are ultimately expended. Needs and revenue comparisons are, therefore, made on the basis of system needs and total revenues available to accomplish the work.

Total state, federal, and local revenues increased from $186,934,00 in 1960 to $240,350,000 in 1966, a gain of approximately 29 per cent during the 6-year period. Federal revenues include apportionments for the federal primary, secondary, and urban systems only. These revenues account for less than 10 per cent of total funds and these apportionments do not vary substantially from year to year. Apportionments of Interstate funds are treated separately and are not included in these figures. The amounts for this system for 1967, 1968, and 1969 are $78,100,650, $88,873,518, and $99,178,575, respectively.

State appropriations for highways have increased from $81,773,000 in 1960 to $104,500,000 in 1966. These are amounts for administration, construction, maintenance, debt service, state aid, and railroad transportation services.

County and municipal revenues increased during the period at about the same rate, somewhat over 30 per cent, to $27,997,000 and $89,086,000, respectively.

Table 56 is presented to show, for 1966, total revenues classified by systems on which funds are ultimately expended. For instance, federal-aid secondary funds, although, administered by the State Highway Department, are used on county roads and are, therefore, credited to county systems. Matching money is supplied from local funds and, ultimately, revenue from both sources is used to satisfy needs charged to counties. The appropriation for debt service is credited to the state system because it is dedicated to retirement of state highway bonds.

TABLE 56

SUMMARY OF REVENUES FOR ALL HIGHWAYS, ROADS, AND STREETS

By System Benefited by Expenditure

1966

REVENUE	*AMOUNT*
Revenues For State Highways	
State Appropriation for Operations[1]	$ 76,603,000
State Appropriation for Debt Service	2,874,000
State Appropriation for Administration State Aid	708,000
Federal-Aid Apportionment[2]	16,786,000
Subtotal, Revenues for State Highways	$ 96,971,000
Revenues For County Roads	
Local Revenues	27,997,000
Federal-Aid Secondary Funds	1,981,000
State Aid[3]	9,360,000
Subtotal, Revenues for County Roads	$ 39,338,000
Revenues For Municipal Streets	
Local Revenues	$ 89,086,000
State Aid[3]	7,005,000
Subtotal, Revenues for Municipal Streets	$ 96,091,000
TOTAL REVENUES FOR HIGHWAYS	232,400,000
Appropriation for Railroad Services[4]	7,950,000
TOTAL REVENUES FOR TRANSPORTATION	$240,350,000

[1]Net after transfer to Bureau of Railroad Transportation.
[2]Federal aid Primary and Urban Funds only.
[3]Does not include appropriation for administering Division of Local Government Aid.
[4]Includes transfers from Department of Transportation.

According to this analysis, a total of $96,971,000 was dedicated to the state system, including federal aid and debt service funds; $39,338,000 to county roads, including local, federal-aid, and state-aid funds; and $96,091,000 to municipal streets, including local and state-aid funds, making a statewide total of $232,400,000. Addition of the $7,950,000 appropriation to the Bureau of Railroad Transportation results in a total of $240,350,000, the same as was given in the previous table.

Projections

For comparison with needs which are prepared for 10, 15, and 20-year periods beginning with 1967, revenues are projected to the end year, 1986, and averages computed for the three possible development periods. For analysis, motor user and other revenues commonly used for highway purposes are estimated, even though some of them are not directly dedicated to highway uses in New Jersey.

Motor Vehicle Registrations — The estimated number of motor vehicles in 1986 was previously indicated to be 5,280,000, composed of 4,645,000 automobiles, 620,000 trucks, and 15,000 buses. These figures were obtained after consideration of estimated population growth, personal income, motor vehicle ownership trends, and economic growth factors for the state and nation.

Population was discussed at length in Chapter 2, and forecasts made to 1986. At that time, the state's population is estimated to reach 9,975,000 persons.

In most states and the nation, the number of persons per registered motor vehicle has followed a characteristic trend which shows that motor vehicles have been increasing at a faster rate than population. In New Jersey in 1940, there were 3.8 persons per vehicle. This number has decreased asymtotically with time and in 1966 had reached a value of 2.2 persons per vehicle. In the United States, there were approximately 4.1 persons per vehicle in 1940 and 2.1 in 1966. Therefore, the growth pattern in New Jersey has closely followed that of the nation.

Characteristically, western states have a higher vehicle density, with persons-to-vehicles ratio currently approximating 1.7 and projected to values as low as 1.5. At about this point, the number of registered vehicles generally approaches one for every person of driver age, assumed to be 15-74 years. Nationwide projections of total persons per vehicle indicate that the ratio will decrease at a very slow rate for the next several decades and will reach a level of 1.8 to 1.9 in 1986. The ratio of driver-age population to registered vehicles in the United States was 1.4 in 1965 and in New Jersey, 1.5. The 1986 estimated persons-per-vehicle ratio in New Jersey is 1.9. It is highly possible that as the density of vehicle ownership approaches saturation more intense use of each vehicle will increase.

In estimating the number of automobiles in 1986, trends in the proportion of automobiles to total vehicles were examined. Since 1950, the proportion of automobiles has varied from 85.7 per cent of the total in 1950 to 89.1 per cent in 1965. In 1966, the ratio was 88.5. Considering the vehicle density in New Jersey and possibilities for improved transportation by other modes, it is judged that this relationship will remain about as at present. Accordingly, automobiles are estimated to be 4,645,000 in 1986, or 88 per cent of total vehicles.

Motor Fuel Consumption — To estimate future use of motor vehicle fuel on highways, it is necessary to examine trends in total travel and travel per vehicle. However, some comments should be made which illustrate the interdependent relationships among statistical factors involved in highway fiscal analysis.

Doubtlessly, population is the key element in the process, and a most important one, as a beginning to the forecasting procedure. Next, motor vehicle registrations and population bear the closest and most predictable relationship, as discussed. This leads to motor fuel consumption per vehicle as the natural approach to projecting total fuel usage. Projections of total travel are based on miles of highway and average annual daily traffic volumes as determined by continuous and periodic traffic counts. As mentioned, forecasts of each of these values, taken singularly, must be reasonably based on past trends and judgment of future conditions. Interplay of values is necessary to produce supportable projections of all quantities.

In New Jersey, use of motor fuel per vehicle averaged 705 gallons in 1935. In 1943, during World War II, average consumption decreased to 522 gallons per vehicle. After the war, use increased to 848 gallons in 1956. Since that time, consumption fell rather steadily to 801 gallons in 1966, with short-term peaks to as much as 860 gallons in 1959.

Nationally, average gallons consumed per vehicle has increased gradually from 728 gallons in 1950 to 775 gallons in 1965, with extreme variations during the period between 728 and 782 gallons. It is believed that usage will increase somewhat in the future.

The average miles per gallon of fuel consumed in New Jersey is expected to increase slightly. Between 1950 and 1965, there was a small decrease nationally from 12.87 miles

per gallon in 1950 to 12.48 miles per gallon in 1965. This was due largely to increases in weight of vehicles, but the downward trend has apparently been slowed by the trend to smaller cars. The present consumption rate in New Jersey is 13.76 miles per gallon. It is believed that the average might increase very slightly in the future — probably by less than 1 mile per gallon in 25 years.

Similarly, national travel per vehicle has been about level in recent years in New Jersey and the United States, and forecasts indicate a possible increase of about 10 per cent during the next several decades.

After analysis of all of these factors, highway use of motor fuel in New York is estimated to total 4,631 million gallons in 1986, or 877 gallons per vehicle. In 1966, total consumption was 2,507 million gallons, or 801 gallons per vehicle. This will represent a gain in total consumption of over 68 per cent during the next 20 years.

Travel — Using average annual travel of 12,300 miles per vehicle in 1986, total travel in New Jersey will be 65 billion miles, compared to 34.5 billion miles in 1966, an increase of over 88 per cent. These values result in an overall average of 14.03 miles per gallon in 1986 compared to 13.76 miles per gallon in 1966. Average annual travel per vehicle in 1966 was 11,026 miles. These trends are shown in Figure 20.

Registration Revenues — Since the Motor Vehicle Division in New Jersey collects a number of fees and taxes which are not usually classified as highway user, an analysis was made of total collections to obtain amounts which are attributed to vehicle licenses and closely related taxes.

Of $103,574,000 collected in 1966, $83,045,000 was considered to be highway user in nature. This is composed of registration fees, duplicate certificates, transfers, duplicate plates, certificates of ownership, temporary plates, motor carrier road taxes, courtesy plates, dealers' permits, and temporary farm permits. Eliminated were collections of sales taxes, drivers' licenses, unsatisfied claims and judgment funds, inspection fees, fines, and other similar items.

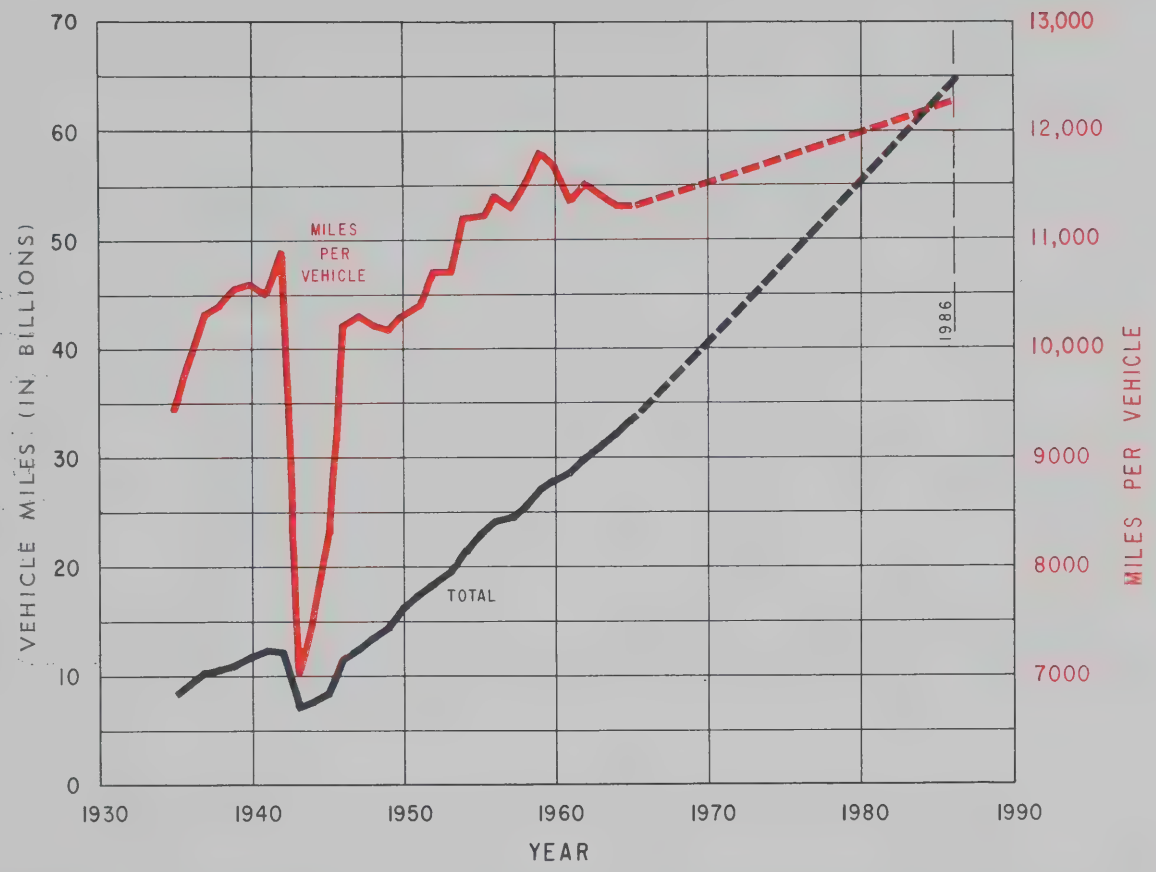
An analysis was also made of collection expenses attributable to activities of the Licensing Bureau. From the 1967 appropriation, 31.6 per cent of the total for the Division of Motor Vehicles was for a portion of administration expense, licensing functions, and collection of motor carriers' road tax. Therefore, of total operating expenses of $15,841,000 in 1966, $5,008,000 was estimated for collection of highway-user taxes. This amounts to 6.0 per cent of highway-user taxes collected in 1966.

Table 57 shows, for 1960-1966, total collections by the Motor Vehicle Division, estimated gross revenues for registration fees and related taxes, and estimated net collection of registration revenues after deduction of prorata collection expenses, estimated at 6.0 per cent. Net collections have increased from $57,051,774 in 1960 to $78,037,003 in 1966. On a vehicle basis, the variation was from a low of $23.62 to a high of $25.19, and the average was $24.45. Assuming present tax rates, total net revenues from registration fees and related taxes are estimated to be $133,084,000 in 1986. This gives effect to 1967 changes in registration fees for trucks.

Motor Fuel Revenues — In projecting the quantity of motor fuel for highway use, weight was given to trends in consumption per vehicle, but trends in refunds for nonhighway use were examined also. Between 1961 and 1966, refunded fuel was reasonably constant between 4.1 per cent and 4.7 per cent of gross revenue collected, and the average was 4.4 per cent. Therefore, no major change in this proportion was anticipated.

Cost of administering the motor fuel acts were analyzed for the effect on future revenues. These costs have totaled approximately $500,000 in recent years and have decreased slightly from approximately 0.48 per cent of gross in 1961 to 0.35 in 1966. These costs are considered to be very low — significantly below the national average — and the likelihood of further reductions is not sufficient to assume substantial change in net revenues.

Based on these observations, net revenue from motor-fuel taxes is assumed to increase from $144,655,000 in 1966 to $267,178,000 in



ANNUAL MOTOR VEHICLE TRAVEL

NEW JERSEY

1935-1966, PROJECTED TO 1986

Wilbur Smith and Associates

FIGURE 20

1986, a gain of almost 85 per cent during the 20 years. This is the same as the percentage increase in motor fuel consumption.

Federal Aid — While intensive study has been and still is being given to the amount and form of federal highway aid to states after completion of the Interstate System in 1973, the program has not crystallized sufficiently to be considered positively in future planning. However, it is believed that the prospect of such additional aid is strong enough that significant weight must be given to the possibility.

Basically, the questions involve the destiny of the 4-cent federal tax on motor fuel and other taxes dedicated to the Federal Highway Trust Fund, and the possible application of funds if the decision is made to continue all or any part of these taxes which are presently scheduled to expire in 1973. A sound approach appears to be to project federal aid for primary,

TABLE 57

ANALYSIS OF REGISTRATION FEES AND RELATED TAXES

New Jersey

1960-1966

YEAR	TOTAL REVENUES COLLECTED BY MOTOR VEHICLE DIVISION	REVENUES FROM REGISTRATION AND RELATED TAXES[1]	NET REGISTRATION REVENUES AFTER DEDUCTION OF COLLECTION EXPENSES	AVERAGE NET REVENUE PER VEHICLE
1960	$ 75,124,689	$ 60,712,753	$ 57,051,774	$ 23.76
1961	78,436,463	63,701,304	59,860,115	23.62
1962	81,064,084	66,078,976	62,094,414	23.80
1963	86,432,712	71,198,995	66,905,696	24.40
1964	93,145,258	76,693,201	72,068,601	25.19
1965	96,661,143	79,509,514	74,715,090	25.08
1966	103,574,383	83,044,592	78,037,003	24.92

[1]Includes license fees and other taxes closely related to vehicle registration. Does not include, drivers' licenses, sales taxes, unsatisfied claim and judgment fund fees, or other nonvehicle fees.

SOURCE: Total revenues and registration revenues from New Jersey Division of Motor Vehicles, *Comparative Annual Revenue Report,* calendar years, 1960-1966. Net revenues estimated.

Consumption of motor fuels increased by 41 per cent in the past 10 years and is expected to grow by 85 per cent in the next 20 years. The 6 cents per gallon state tax produced 22 per cent of general revenues from all sources, or a net of $145,000,000 in 1966. By 1986, net revenues should increase to $267,000,000.

secondary, and urban systems at current levels and to consider increased aid as a possible source of additional revenue. In this way, basic projected revenues will be those reasonably certain of realization, and possible increases can be given weight commensurate with the level of needs and judgment of the amount and form of future aid.

Accordingly, federal-aid funds for primary, secondary, and urban systems for 1967 through 1986 are estimated at the level of the apportionments for 1966. For New Jersey this is $6,016,770 for the primary system, $1,981,060 for federal secondary roads, and $10,769,268 for urban highways, making a total of $18,767,098.

Since apportionments for the Interstate System will be tailored to match needs for completing this system, appropriate compensating adjustments are made to exclude the federal share of these needs so that further estimate of Interstate funds will not be necessary. Needs to complete the Interstate System in each state will be revised frequently until the program is consummated.

Local Municipal Revenues — As shown previously, local revenues for urban streets are derived principally from property taxes and special assessments, bus taxes, and general fund appropriations. The latter have provided, by far, the greatest portion of revenues in the recent past. Revenues from each of the two former sources have shown no significant trend and amounted to approximately $1,813,000 and $1,256,000 in 1965, and averaged $1,732,000 and $1,607,000, respectively, between 1960 and 1965. General fund appropriations totaled $82,821,603 in 1965, a general increase from $62,693,704 in 1960.

There is little economic basis for forecasting appropriations from general funds. These obviously depend on needs, availability of funds, and relative need for local services and facilities. Based on estimated urban population in 1986, general fund appropriations are projected at $18.50 per person, compared to approximately $11.65 in 1960 and $13.80 in 1965. This projection results in a general fund appropriation of $163,500,000 in 1986.

Projecting property taxes and bus taxes at average values shown above, results in total municipal revenues of $166,839,000 in 1986, compared $85,890,000 in 1965.

County Local Revenues — Local revenues for county roads are derived from general fund appropriations, motor vehicle fines and in some

TABLE 58

PROJECTED HIGHWAY-USER AND OTHER REVENUES
FOR HIGHWAY PURPOSES

Based on Present Levels of Taxation

New Jersey

1966 and 1986

REVENUE SOURCE	*REVENUE*	
	1966	*1986*
Motor Vehicle Registrations[1]	$ 78,037,003	$133,084,000
Motor Fuel Taxes	144,655,000	267,178,000
Federal Aid ABC Funds	18,767,000	18,767,000
Local Municipal Revenues[2]	85,890,181	166,839,000
Local County Revenues[2]	27,222,222	52,900,000
TOTAL	$354,571,406	$638,768,000

[1]Motor vehicle registrations and related revenue. Total collections of Motor Vehicle Division not shown.
[2]1965 data.

years, small amounts of miscellaneous revenues. General funds furnish the largest portion of county road revenues. Based on past trends, general fund appropriations are projected to $46,800,000 in 1986 and motor vehicle fines to $6,100,000, making total revenues for county roads $52,900,000 in 1986.

Summary of Projected Revenues — A summary of projected motor user revenues and other highway funds is presented in Table 58 together with corresponding values for 1966 for ready comparison. Total revenues are estimated to increase from $354,571,406 in 1966 to $638,768,000 in 1986. These figures consider total collection of motor fuel tax and registrations rather than appropriations.

Year-by-year growth trends for these revenue sources are shown in Table 59.

TABLE 59

ESTIMATED ANNUAL REVENUES
FROM STATE AND LOCAL TAX SOURCES
1967-1986

YEAR	MOTOR VEHICLE REGISTRATIONS	MOTOR FUEL TAXES	LOCAL MUNICIPAL REVENUES (thousands)	LOCAL COUNTY REVENUES
1967	80,789	$150,781	$ 93,599	$29,668
1968	83,542	156,907	97,454	30,890
1969	86,294	163,033	101,309	32,113
1970	89,046	169,160	105,164	33,336
1971	91,799	175,286	109,018	34,558
1972	94,551	181,412	112,873	35,781
1973	97,303	187,538	116,728	37,004
1974	100,056	193,664	120,582	38,227
1975	102,808	199,790	124,437	39,450
1976	105,560	205,916	128,292	40,672
1977	108,313	212,043	132,146	41,895
1978	111,065	218,169	136,001	43,118
1979	113,818	224,295	139,856	44,341
1980	116,570	230,421	143,711	45,563
1981	119,322	236,547	147,565	46,786
1982	122,075	242,673	151,420	48,009
1983	124,827	248,800	155,275	49,232
1984	127,579	254,926	159,129	50,454
1985	130,332	261,052	162,984	51,677
1986	133,084	267,178	166,839	52,900
Average 10-Year	93,175	178,349	110,946	35,170
Average 15-Year	100,056	193,664	120,582	38,227
Average 20-Year	106,937	208,980	130,219	41,284

COST RESPONSIBILITY FOR NEW JERSEY'S HIGHWAY PROGRAM

Chapter 7

Before the advent of the motor vehicle, roads and streets were financed principally by general tax funds or special assessments. These limited sources of revenue could only provide the minimum type of facility required for serving predominant land-access functions.

Since the turn of the century, there has been a continuing upward trend in the use of highways for longer motor vehicle trips, traffic volumes have increased significantly, and the functional characteristics of roads and streets have been greatly altered. Travel demands have often exceeded the capacity of major portions of the state's highway systems, especially with the increase in use of motor vehicles over three decades. In addition to satisfying requirements for greater mileage of roads and streets, legislators and highway administrators have been faced with the problem of financing roadways for which unit costs for construction and maintenance are higher and which require higher design standards.

Demands for increased revenues have effected changes in the methods of highway finance, and complex financial structures have evolved. Methods of highway finance have turned to motor user taxes which almost wholly support the primary highway systems of the nation. The first of these taxes was in the form of registration fees; subsequently, fuel taxes were instituted, and more recently mileage taxes in some states. User tax schedules have been formulated based on the judgment of highway administrators and legislators, because of the lack of factual information concerning cost responsibilities. As a result, there is no assurance that the complex structure of fees and taxes is equitably assessed to highway beneficiaries. Therefore, it is important that New Jersey re-evaluate its present tax system as it relates to the future requirements of the highway and street systems.

Today this re-evaluation of the tax structure may be accomplished based on better and more detailed data and more refined allocation techniques than have previously been available. Highway agencies have continually upgraded the quality and availability of data necessary for determination of parameters for cost allocation such as vehicle registrations, travel, and weight. In addition, extensive research concerning the measurement of benefits and the costs involved in providing highway facilities for specific vehicles have provided bases for more precise and theoretically equitable allocation procedures.

Concepts of Cost Allocation

Determination of an equitable distribution of tax burden is neither a new problem nor one that is peculiar to the area of highway finance. Economists have long recognized a number of bases for levying taxes. The cost incurred principle has been most often applied to highway financing, since it is more appropriate in those areas of governmental functions where measurable benefits to specific groups can be determined.

The recipients of special benefits from highways can, in the most part, be isolated. Special taxes levied on classes of beneficiaries may be justified by the costs incurred in providing the benefits which accrue from government functions. Therefore, since vehicle owners require governmental expenditures for road facilities, user taxes, such as vehicle license fees and motor fuel taxes, can be justifiably imposed. Based on this premise, heavy trucks, which require more substantial roadway structures, can be assessed additional taxes or higher tax rates.

In addition to the benefits accruing to highway users, the general public also benefits in a variety of ways: increased land values, or-

An equitable allocation of highway costs requires separation of the highway-user and general public shares of the total program. Arterial facilities basically provide highway-user benefits and are a responsibility of this group of beneficiaries. The general public is the primary recipient of the benefits of local facilities and should be responsible for cost of these roads and streets. Collector facilities have a more balanced relationship between highway-user and general public benefits with cost responsibilities being assigned accordingly.

ganize land-use development, improved governmental services, and better tourist facilities. Indirect highway benefits are not easily evaluated, nor can they be assigned to specific segments of the general tax structure. These nonuser benefits must, therefore, be considered as improvements to the state's socioeconomic condition. The fact that some of these costs and benefits are so difficult to assign is evidence that they should be considered general costs of government.

The allocation of cost responsibility for highways may be separated into two basic areas. The first phase is to determine that proportion of the highway revenue requirement which should be satisfied by highway users and the portion which should be financed through nonuser funds. The second phase is to further subdivide the highway-user portion between classes of vehicles so that differential tax rates may be assessed in accordance with the differential cost incurred in building highways for these specific classes.

User and Nonuser Allocation

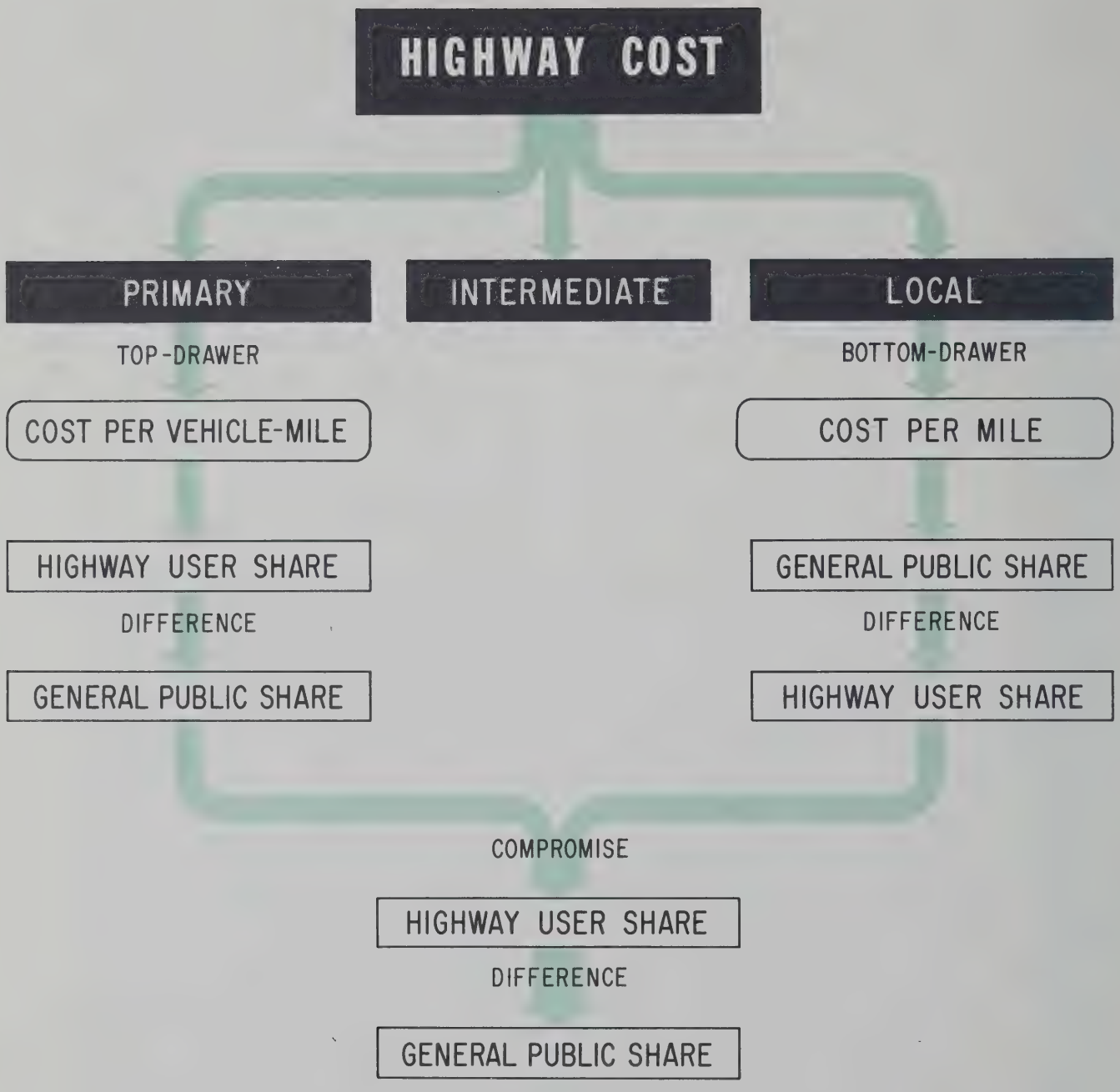
The principle of dividing responsibility for highway improvements between users and the general public is fundamental, even though the specific and general beneficiary may often be the same person. However, this separation in the tax base is necessary because the benefits provided by many highway facilities are more closely related to the bases for general taxation than to specific user taxes. A number of methods have been devised to allocate cost between users and nonusers, and the most widely accepted has been the earnings-credit analysis. The method derives its name from the fact that roads are "credited" with hypothetical "earnings" based on travel in much the same manner as tolls would be credited if they were the method of financing.

The earnings-credit solution is a compromise of two different hypotheses. Cost assessments determined in the first phase of the earnings-credit solution are related to traffic service costs. The first phase of the solution involves approximate measurement of the amount highway users should pay for each vehicle-mile of travel on the various highway systems. It is assumed that such benefits may be measured as the cost of the functional levels providing major traffic service for through movements divided by the total vehicle-miles of travel on these systems. In the first phase of the earnings-credit method, often called the top-drawer solution, this cost per vehicle-mile is assigned to travel on all highway systems. The residual cost obtained by subtracting the earnings credited to motor vehicles on each of the systems from the total cost of the systems is assigned to the general public. Thus, motor vehicle users are assessed the same charge per vehicle-mile of travel on all highway systems with the general public assessed only the needs remaining on each system after deduction of the user share.

The second phase of the earnings-credit method, called the bottom-drawer solution, is an attempt to measure general public benefits. The bottom-drawer solution assumes that benefits derived from local or land service roads are so distinctly related to nonuser benefits that the general public should be responsible for the total cost of such facilities. It is further assumed that this cost per mile represents the benefits which the general public receives from all classes of facilities. By multiplying this cost per mile times the mileage on all systems, the total general public assessment is determined. Again the residual cost, after deduction of the general public share from the total needs, is assigned to the highway user, as illustrated in Figure 21.

These two approaches are not sufficiently accurate in themselves to provide a firm basis for cost allocation. The first solution discriminates against the motor user in that it fails to recognize that some portion of the cost of the top category of facility should be borne by the general public because of benefits derived therefrom. The second solution discriminates against the nonuser in that it fails to recognize that earnings are generated on the lower classes of facilities by the motor vehicle travel upon them.

Therefore, a compromise of the two solutions is necessary to reconcile the inherent differences between them. The compromise solution aver-



EARNINGS-CREDIT COST ALLOCATION CONCEPT

Wilbur Smith and Associates

FIGURE 21

ages the cost per vehicle-mile determined in the top-drawer and bottom-drawer solutions and assigns this to all travel on all systems. In effect earnings from motor vehicle travel are then credited to each system in relation to the amount of travel on that system. In this way the compromise solution recognizes that each highway class benefits both the motor vehicle user and the nonuser and thereby provides a more satisfactory answer to the separation of user and nonuser cost responsibilities.

The earnings-credit solution requires a separation of highways and highway needs into groups of similar characteristics. The basis of separation in this study was the functional classification system which indicates the service characteristics of the facility. The primary group of roads and streets included those facilities which provide the greatest benefits to motor vehicle users. The local group included roads and streets which primarily provide access services to abutting properties. The intermediate group was composed of facilities which have a closer balance between highway-user and general public benefits than do the top and bottom categories.

The primary group included Interstate, major, and area service highways as well as the urban portions of collector highways. The intermediate group comprised rural collector highways and primary and secondary thoroughfares. Local access roads and commercial and residential streets were placed in the third group.

For the earnings-credit calculations, 20-year program costs were used for all highway systems. The total cost of the Interstate System, including the federal share of initial construction costs, was included. These costs totaled $587,195,200 a year, of which $288,336,100 was for the primary group, $96,834,200 was for the intermediate class, and $202,024,900 was for local facilities. Based on the average miles during the study period, these costs amount to $15,711 per mile as shown in Table 60. This average mileage consists of the completed Interstate System and the average number of miles in each of the other functional classes expected to be in service during the study period. The cost per vehicle-mile amounts to 12.7 mills based on the average annual travel during the 20-year study period on facilities included in the needs appraisal. Travel on toll roads and other facilties was not included.

TABLE 60

DATA FOR COMPUTING HIGHWAY COST RESPONSIBILITY

Earnings-Credit Method

New Jersey

1967-1986

HIGHWAY SYSTEM	*AVERAGE ANNUAL COST*[1] *(thousands)*	*AVERAGE MILES*[2]	*ANNUAL COST PER MILE*	*AVERAGE ANNUAL VEHICLE-MILES (millions)*	*COST PER VEHICLE-MILE (mills)*
Primary	$288,336.1	3,761.5	$76,654.55	25,269.4	11.410485
Intermediate	96,834.2	4,723.2	20,501.82	9,761.5	9.920012
Local	202,024.9	28,890.9	6,992.68	11,339.1	17.816661
TOTAL ALL SYSTEMS	$587,195.2	37,375.6	$15,710.66	46,370.0	12.663256

[1]Based on 20-year program, federal share of Interstate construction costs included.

[2]Includes the average miles in all functional classifications except for Interstate highways, completed mileage on this system included.

TABLE 61

DETERMINATION OF HIGHWAY COST RESPONSIBILITY BY THE EARNINGS-CREDIT METHOD

Top-Drawer Solution

New Jersey

HIGHWAY SYSTEM	MOTOR VEHICLE SHARE		GENERAL PUBLIC SHARE
	Amount (thousands)	Per Vehicle-Mile (mills)	(thousands)
Primary	$288,336.1	11.410485	$ —
Intermediate	111,383.5	11.410485	(14,549.3)
Local	129,384.6	11.410485	72,640.3
TOTAL ALL SYSTEMS	$529,104.2	11.410485	$58,091.0

The top-drawer solution was based on a cost of 11.4 mills per vehicle-mile, representing the cost of primary highways related to the travel on these facilities. This resulted in a total user share of $529,104,200 with a residual cost amounting to $58,091,000 assigned to the general public as indicated in Table 61.

In the bottom-drawer solution the general public assessment was based on a cost of $6,993 per mile and amounted to $261,355,700. The residual cost of $325,839,500 was assigned to the highway user and amounted to 7.0 mills per vehicle-mile as shown in Table 62.

The compromise of the top-drawer and bottom-drawer solution resulted in a cost of 9.2 mills per vehicle-mile. This resulted in a cost of $427,471,900 assigned to the highway user and $159,723,300 assigned to the general public as shown in Table 63. The total assessment to the highway user for all highway systems amounted to 72.8 per cent of the statewide annual costs included in the analysis. The general public share amounted to 27.2 per cent.

Cost Responsibilities Applied to Administrative Systems — As developed in the earnings-

TABLE 62

DETERMINATION OF HIGHWAY COST RESPONSIBILITY BY THE EARNINGS-CREDIT METHOD

Bottom-Drawer Solution

New Jersey

HIGHWAY SYSTEM	GENERAL PUBLIC SHARE		MOTOR VEHICLE SHARE	
	Amount (thousands)	Per Mile	Amount (thousands)	Per Vehicle-Mile (mills)
Primary	$ 26,303.0	$6,992.68	$262,033.1	10.369581
Intermediate	33,027.8	6,992.68	63,806.4	6.536536
Local	202,024.9	6,992.68	—	—
TOTAL ALL SYSTEMS	$261,355.7	$6,992.68	$325,839.5	7.026946

TABLE 63

DETERMINATION OF HIGHWAY COST RESPONSIBILITY BY THE EARNINGS-CREDIT METHOD

Compromise Solution

New Jersey

HIGHWAY SYSTEM	MOTOR VEHICLE SHARE		GENERAL PUBLIC SHARE
	Amount (thousands)	Per Vehicle-Mile (mills)	(thousands)
Primary	$232,951.4	9.218716	$ 55,384.7
Intermediate	89,988.5	9.218716	6,845.7
Local	104,532.0	9.218716	97,492.9
TOTAL ALL SYSTEMS	$427,471.9	9.218716	$159,723.3

credit analysis, the determination of highway-user and general public cost responsibilities is based upon the functional classification system. Each administrative level under both the present and recommended assignments of administrative jurisdiction is composed of several of the functional classifications. Therefore, to indicate the extent to which each of the administrative systems provides service related to highway user and to the general public, the results of the earnings-credit solution are applied to administrative systems as shown in Table 64.

For the existing state system the user responsibility totals $186,801,600 or 71.2 per cent of the total cost for the system, including the federal share of Interstate construction costs. For the existing county highway system, the total annual cost amounts to $77,592,400 while a total of $104,439,800 was assigned as the responsibility of highway users. This means that user earnings, based on travel on the system, will exceed the cost of the system by 34.6 per cent. Of the $247,120,100 annual cost for the municipal system, $136,230,500 or 55.1 per cent is assigned to the highway user. The residual cost on each of these systems is assigned to the general public and amounts to 29.8 per cent of the State Highway System cost and 44.9 per cent for the municipal system and a credit of 34.6 per cent of the cost of the county system.

On the basis of the recommended division of administrative responsibility, $163,401,800 is assigned to the highway user for state highways compared to total costs of $251,168,100. The highway-user share therefore represents 65.1 per cent of the total cost of this system. User earnings on county highways amount to $92,118,000 or 55.7 per cent more than the total cost of $59,182,400. Annual cost of the recommended municipal system totals $276,844,700 of which $171,952,100 or 62.1 per cent is assigned to the highway user. The general public share of the recommended highway systems amounts to 34.9 per cent for state highways and 37.9 per cent for the municipal system. A credit amounting to 55.7 per cent of the cost for the county system is applied to these cost assessments.

State Highway-User Cost Responsibility — User responsibility was determined as 9.2 mills per vehicle-mile based on the total statewide system of highways, roads, and streets. This is the average amount which should be charged users to finance the total system equitably. However, the cost assignment to highway users for travel on both the existing and recommended County Highway System exceeds the amount required to improve and maintain these systems during the program period. The total cost of these two systems amounts to 6.8 and

TABLE 64

SUMMARY OF HIGHWAY-USER AND GENERAL PUBLIC COST RESPONSIBILITIES

New Jersey

1967-1986

ADMINISTRATIVE SYSTEM	AVERAGE ANNUAL COST[1] (thousands)	HIGHWAY-USER SHARE		GENERAL PUBLIC SHARE	
		Amount (thousands)	Per Cent	Amount (thousands)	Per Cent
Existing					
State	$262,482.7	$186,801.6	71.2	$ 75,681.1	29.8
County	77,592.4	104,439.8	134.6	(26,847.4)	(34.6)
Municipal	247,120.1	136,230.5	55.1	110,889.6	44.9
TOTAL	$587,195.2	$427,471.9	72.8	$159,723.3	27.2
Recommended					
State	$251,168.1	$163,401.8	65.1	$ 87,776.3	34.9
County	59,182.4	92,118.0	155.7	(32,935.6)	(55.7)
Municipal	276,844.7	171,952.1	62.1	104,892.6	37.9
TOTAL	$587,195.2	$427,471.9	72.8	$159,723.3	27.2

[1]Based on 20-year program, includes federal share of Interstate construction costs.

5.9 mills per vehicle-mile, respectively. While the assessment of 9.2 mills is an equitable assessment on a statewide basis, logic dictates that user earnings should not be credited to any single system in excess of the amount required for its improvement and operation. Therefore, adjustments are necessary to reflect an appropriate transfer of excess earnings on the county system to the state and municipal systems. This requires a reasonable interpretation of the earnings-credit analysis which is generally consistent with the results of the solution. In addition, recognition must be given to the amount of federal aid to be applied to each of the systems, with this amount to be deducted from the total user share to determine the amount to be financed by state user taxes.

In Table 65, these two adjustments are made to the tabulations of user responsibility by administrative system. The first adjustment provides for 100 per cent financing of county highways by highway-user tax revenues. To accomplish this it was assumed that the total highway-user share of all cost would remain constant at $427,471,900 a year or 72.8 per cent of the total cost. Therefore, the highway-user share of the State and Municipal Highway Systems was increased on a proportional basis so that the total highway-user share remained at the same level as determined by the earnings-credit analysis. This results in the highway-user share of the existing State Highway System being increased to 77.1 per cent. Similarly, the highway-user share of the existing municipal system would amount to 59.7 per cent. On the recommended systems, state highway costs amounting to 71.4 per cent would be assigned to the highway user and for the municpal system, 68.2 per cent.

These costs include the total responsibility of highway users. Federal aid distributed to the state is derived from the Highway Trust

TABLE 65

DISTRIBUTION OF HIGHWAY-USER COST RESPONSIBILITY

New Jersey

1967-1986

ADMINISTRATIVE SYSTEM	AVERAGE ANNUAL COST (thousands)	ADJUSTED HIGHWAY USER SHARE		FEDERAL AID (thousands)	STATE USER SHARE	
		Amount (thousands)	Per Cent		Amount (thousands)	Per Cent of Total
Existing Systems						
State	$262,482.7	$202,326.8	77.1	$53,448.3	$148,878.5	40.0
County	77,592.4	77,592.4	100.0	1,981.0	75,611.4	20.3
Municipal	247,120.1	147,552.7	59.7	—	147,552.7	39.7
TOTAL	$587,195.2	$427,471.9	72.8	$55,429.3	$372,042.6	100.0
Recommended Systems						
State	$251,168.1	$179,449.7	71.4	$53,448.3	$126,001.4	33.9
County	59,182.4	59,182.4	100.0	1,981.0	57,201.4	15.4
Municipal	276,844.7	188,839.8	68.2	—	188,839.8	50.7
TOTAL	$587,195.2	$427,471.9	72.8	$55,429.3	$372,042.6	100.0

Fund in which are deposited the revenues from federal highway-user taxes. Therefore, in essence, federal-aid allocations to the state represent the federal share of the total highway-user cost responsibility. Deduction of the amount of anticipated federal aid under present policies from the total highway-user share results in the amount which must be offset by state highway-user taxes. This amount totals $55,429,300 averaged over the 20 years and is distributed to the administrative systems as shown in Table 65. This includes the federal share of Interstate construction costs as well as ABC funds. Additional federal funds after 1973 above those presently programmed are not included.

The total highway-user share reduced by the amount of anticipated federal aid results in a total requirement for state user taxes of $372,042,600 annually. Of this amount 40.0 per cent is for the existing State Highway System, 20.3 per cent for county highways, and 39.7 per cent for the municipal system. On the basis of the recommended administrative jurisdictions, the total requirements for state user taxes would be divided 33.9 per cent for the state, 15.4 per cent to counties, and 50.7 per cent to municipalities.

Cost Responsibility Among Classes of Highway Users

The earnings-credit solution provides a separation of cost into two major categories — motor vehicle users and the general public. It is necessary, however, to allocate cost responsibilities further. Procedures are not sufficiently precise to allocate the general public share of the highway finance program satisfactorily to specific beneficiaries. Therefore, this portion of cost responsibility must be financed within the general taxing procedures of the various governmental units. Fiscal judgment will be

required to determine the degree to which the general public cost should be assigned to property owners for benefits rendered to the land or assigned as an excise tax because of general economic benefits.

Methods have been developed, however, by which the highway-user share may be assigned to specific classes of users because of special costs incurred. Each of these methods recognizes that highway-user taxes should be based on some graduated basis of payment, varying with weight, size, and number of miles traveled. Highway-user taxes are based on a number of criteria: vehicle ownership, type and weight of vehicle, type of motor fuel used, and travel expressed in terms of vehicle-miles, axle-miles, or ton-miles. This is a sound approach to highway taxation, since the same criteria are generally used for allocating tax responsibility among various types of vehicles.

Although extensive research has been conducted to establish an equitable distribution of the tax burden among highway users, no single method has been devised whereby the assignment of highway-user cost responsibility meets with acceptance by all classes of users. To provide optimum guides for evaluating the present tax structure and formulating recommendations for future changes in the tax structure, cost allocation analyses based on several theories have been made during this study. These include the incremental, cost-function, vehicle-mile, and ton-mile methods. Of these four approaches, the incremental method provides the best solution because of its sound theoretical basis. The results of the incremental allocation are presented in this section of the report; the results of the other solutions are included in the Appendix and generally substantiate the findings of the incremental method.

The average annual amount allocated to the various classifications of motor vehicle users registered in New Jersey by each of the analysis methods totaled $372,042,600. The total user allocation is equal to the user responsibility for highway purposes as determined by the earnings-credit method ($427,471,900) reduced by the annual federal aid which can be anticipated during the 20-year period. Federal-aid deductions totaled $55,429,300, representing the federal share of the Interstate program and the ABC programs with deductions made from construction cost items on a system basis. The total annual cost of $372,042,600, therefore, represents the amount of state user taxes which equitably should be collected from motor vehicles for their use of New Jersey's highways.

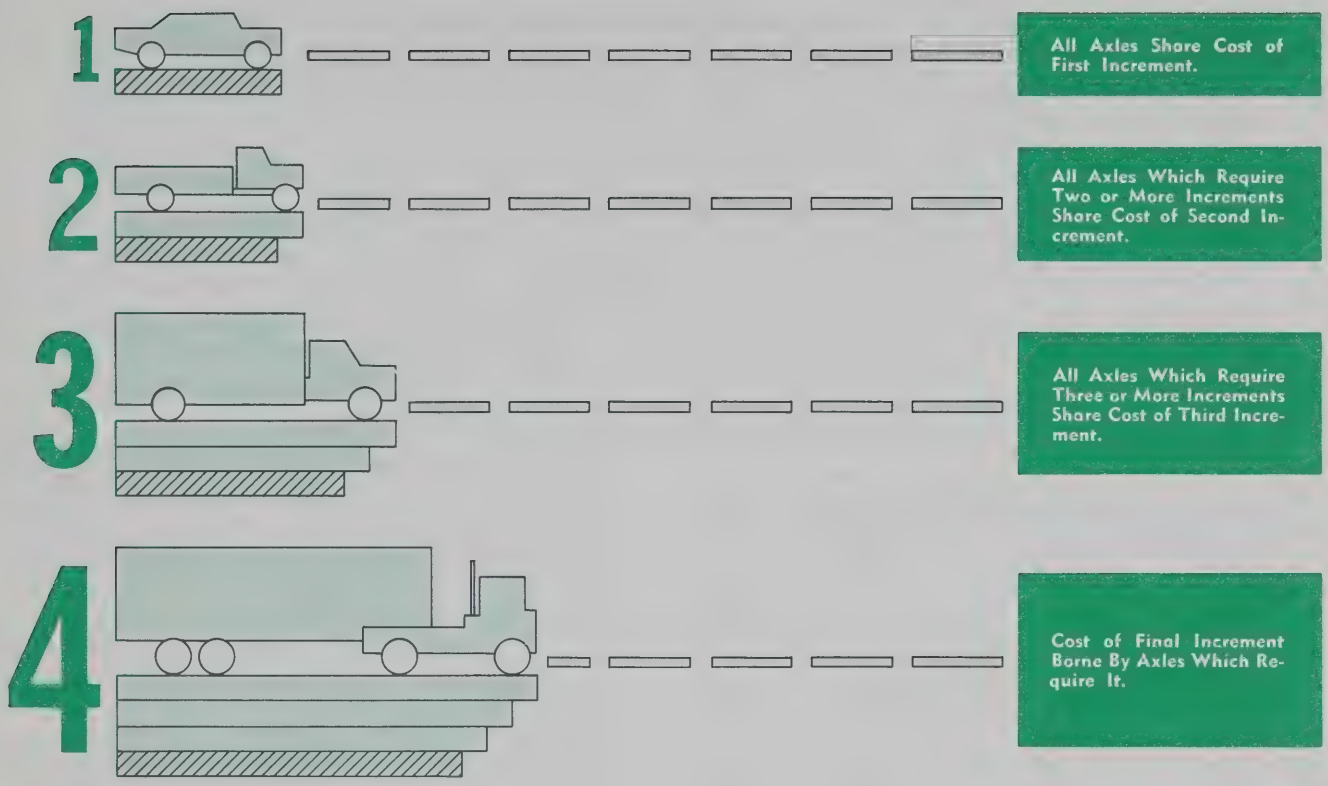
Incremental Solution — The cost-incurred doctrine of highway taxation requires the determination of special expenditures by governmental programs for specific vehicles.

The basic concept of the incremental method is that certain highway expenditures can be separated into increments of cost incurred in accommodating specific vehicles. Each vehicle is assessed charges for those increments of expenditure creditable to a specific vehicle, as illustrated in Figure 22. Additional expenditures required by heavier and larger vehicles are assessed only against those vehicles which require additional expenditures.

In practice, the cost of the first increment of expenditure — that cost which would be incurred if the road were built only for the use of the smaller type vehicles — is assigned to all vehicles on the basis of a selected measure of travel. The second and each succeeding increment are assigned to all vehicles weighing as much as or more than the cut-off weights for that increment. To make accurate determinations of cost assignments by the incremental method requires extensive breakdowns of roadway costs, vehicular travel, and vehicle operating weight data.

The incremental method requires the determination of cost responsibility within four major groups: base and surface costs, grading and drainage costs, structure costs, and a cost category which includes all other items. Each of these categories must be allocated individually, since different vehicular elements affect each one.

Although the incremental cost assignment concept has been advanced for a number of years, only recently has reliable application of the method been achieved. The criteria, data,



HIGHWAY-USER COST ALLOCATION
INCREMENTAL CONCEPT

Wilbur Smith and Associates

FIGURE 22

and techniques required for application of this method have been developed by the AASHO Road Test, which was conducted by the Highway Research Board of the National Academy of Sciences, National Research Council, and the American Association of State Highway Officials.

As indicated in the results of the road test, the frequency and weight of axle loads are the primary factors in the performance of pavement sections. The results of research conducted in the road test have been resolved into formulas which express the relationship between pavement performance, pavement thickness, and axle load applications. Separate formulas have been developed for rigid and flexible pavements, as explained in the *AASHO Road Text, Report 5, Pavement Research,* published by the Highway Research Board, National Academy of Sciences, National Research Council.

The various increments of pavement thickness required by the traffic loads anticipated during the program period were developed using these formulas. These increments of thickness were then related to pavement designs and cost estimates to determine the portion of base and surface costs to be included in each increment.

The cost of base and surface improvements on the several highway systems was separated into increments and distributed to vehicles on the basis of the axle-miles of travel requiring particular increments of construction. The total of base and surface costs thus distributed was $80,404,500. This amount was allocated 43.1 per cent to passenger cars, 8.6 per cent to buses, and 48.3 per cent to trucks.

Unlike pavement costs, the primary elements influencing structure costs are vehicular gross weight and axle arrangements. Design requirements conforming to AASHO bridge specifications and related to design cost estimates provided the basis for separating the costs of structures into increments. Structure costs were then distributed to the various vehicles on the basis of vehicle-miles of travel within each gross operating weight increment requiring a particular design loading. Structure costs totaled $35,644,900 and were allocated 30.3 per cent to passenger cars, 5.4 per cent to buses, and 64.3 per cent to trucks.

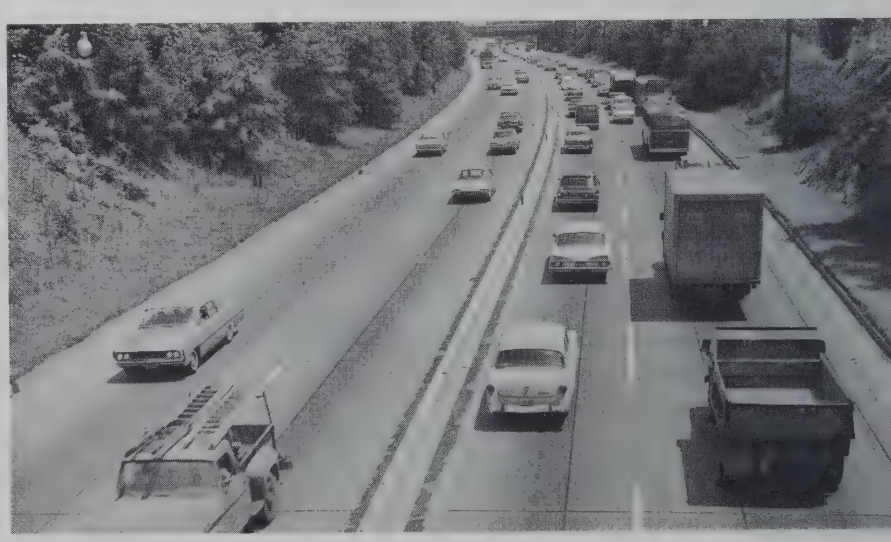
The cost of grading and drainage is partially influenced by vehicle size. Vehicles of 10,000 pounds or more gross weight have been assigned responsibility for 8.5 per cent of grading and drainage costs. This amount is based on assumed requirements for additional pavement width, shoulder width, and increased length of drainage structures. The two increments of grading and drainage cost — 91.5 per cent to all vehicles and 8.5 per cent to those weighing 10,000 pounds or more — were allocated on the basis of vehicle-miles of travel within these gross weight increments. Total costs of $46,885,600 were thus assigned 77.2 per cent to passenger cars, 2.2 per cent to buses, and 20.6 per cent to trucks.

The remaining costs consisted of items which could not be separated into increments required by specific vehicles. These nonincremental items included right-of-way, railroad protection and overpasses, traffic services, roadside improvements, resurfacing, and general and pavement maintenance.

Pavement maintenance and resurfacing costs are affected by the frequency and weight of vehicle loadings and these costs were distributed to all vehicles on the basis of ton-miles of travel. Pavement maintenance and resurfacing costs totaling $68,729,800 were allocated 66.3 per cent to passenger cars, 3.3 per cent to buses, and 30.4 per cent to trucks.

The remaining nonincremental costs, sometimes referred to as first increment items, were assigned to all vehicle classes on the basis of vehicle-miles of travel. Benefits from these items are assumed to accrue equally to all vehicles based on their travel on the highway system. These items totaled $140,367,800 or 37.7 per cent of the total user allocation, and were distributed 83.8 per cent to passenger cars, 0.9 per cent to buses, and 15.3 per cent to trucks.

The amount allocated thusly totaled



A sound highway finance program requires that motor-vehicle owners be assessed for their use of highways and streets. Because large trucks require thicker pavements and stronger structures and because their annual travel is generally greater than other vehicles, these vehicles are allocated higher cost responsibilities than automobiles and light trucks.

TABLE 66

SUMMARY OF INCREMENTAL ALLOCATION

Average Annual State User Share

New Jersey

1967-1986

REGISTRATION CLASS	BASE AND SURFACE	STRUCTURES	GRADING AND DRAINAGE	PAVEMENT MAINTENANCE AND RESURFACING	FIRST INCREMENT ITEMS	TOTAL
			(thousands)			
Passanger Cars	$34,630.4	$10,813.3	$36,212.7	$45,538.0	$117,662.0	$244,856.4
Buses	6,948.1	1,925.8	1,034.4	2,287.1	1,312.0	13,507.4
Trucks[1]						
2- 6	3,533.8	641.5	2,351.4	3,989.3	7,628.9	18,144.9
6-10	1,829.4	178.4	638.1	1,443.7	2,082.1	6,171.7
10-16	2,000.4	332.7	592.4	1,193.6	1,329.0	5,448.1
16-22	3,949.4	733.2	1,012.7	1,995.3	1,653.4	9,344.0
22-28	3,716.6	849.9	731.0	1,544.5	1,061.9	7,903.9
28-36	6,920.4	1,561.6	973.9	2,217.0	1,428.5	13,101.4
36-44	1,768.3	1,082.0	415.5	895.2	663.5	4,824.5
44-52	1,493.5	1,197.6	355.2	764.7	624.1	4,435.1
52-60	3,227.7	2,859.4	623.6	1,496.9	1,118.6	9,326.2
60-68	5,629.5	5,913.6	942.6	2,485.5	1,749.1	16,720.3
68-72	4,767.0	7,555.9	1,002.1	2,879.0	2,054.7	18,258.7
TOTAL	$80,414.5	$35,644.9	$46,885.6	$68,729.8	$140,367.8	$372,042.6

[1]Gross weight in thousands of pounds.

$372,042,600 with $244,856,400 or 65.8 per cent assigned to passenger cars. Buses were assigned an amount totaling $13,507,400 or 3.6 per cent of the total. The remaining costs, amounting to $113,678,800 and representing 30.6 per cent of the total, were allocated to trucks as shown in Table 66.

Tabulations have been prepared to indicate the user responsibility based upon the registration structure utilized in New Jersey. Trucks are registered on the basis of gross weight, and 11 classes, based on a graduated weight basis, have been established to indicate the increasing responsibility of heavier vehicles. The cost assessments by the incremental method are presented in Table 67. The responsibilities of passenger cars for state user taxes amount to $66 per vehicle per year. The responsibility of buses amounts to an annual cost of $1,228. For trucks in the lightest registered weight group, 2,000 to 6,000 pounds gross weight, the annual cost approximates $72 per vehicle. For the heaviest trucks, 68,000 to 72,000 pounds gross weight, the annual assessment is $1,259 per vehicle. These costs represent the average amount which should be paid by vehicles within the classifications for travel by such vehicles within New Jersey.

Based on vehicle travel, cost assessment for automobiles amounts to 0.63 cents per vehicle-mile. Buses are assigned a cost of 3.41 cents per vehicle-mile. For trucks between 2,000 and 6,000 pounds, the cost per vehicle-mile is 0.74 cents. As might be expected, heavier trucks are

TABLE 67

INCREMENTAL ALLOCATION OF HIGHWAY-USER STATE TAX RESPONSIBILITY

New Jersey

1967-1986

REGISTRATION CLASS	ANNUAL COST RESPONSIBILITY		
	Per Vehicle (dollars)	Per Vehicle-Mile (cents)	Per Ton-Mile (mills)
Passenger Cars	66	0.63	3.43
Buses	1,228	3.41	3.25
Trucks[1]			
2- 6	72	0.74	3.08
6-10	102	0.91	2.81
10-16	166	1.22	2.59
16-22	272	1.67	2.57
22-28	423	2.19	2.64
28-36	621	2.68	2.57
36-44	603	2.10	1.65
44-52	704	1.99	1.32
52-60	982	2.31	1.31
60-68	1,296	2.62	1.27
68-72	1,259	2.35	1.00

[1]Gross weight in thousands of pounds.

assessed higher rates per mile of travel amounting to 2.35 cents for those between 68,000 and 72,000 pounds gross weight.

Cost allocations to passenger cars total 3.43 mills per ton-mile and for buses, 3.25 mills per ton-mile. Light trucks between 2,000 and 6,000 pounds are assessed a responsibility of 3.08 mills per ton-mile. The assessments to heavier trucks are much less based on ton-miles and amount to 1.00 mills for those between 68,000 and 72,000 pounds gross weight.

Other Solutions — Since the incremental method requires extensive breakdowns of travel and vehicular weight data, it is still advisable to consider more than one method of allocation. Therefore, to evaluate the equity of the incremental cost allocation and to provide optimum guides for the development of recommendations on user taxation, cost allocation analyses have been conducted according to three other solutions. Each of these methods, while not considered to be as equitable in theory as the incremental approach, provides useful reference points for evaluating other solutions. Allocation by the cost-function, vehicle-mile, and ton-mile solutions have, therefore, been prepared for comparative purposes.

The cost-function method attempts to allocate user responsibility on the basis of functional costs and relative use factors. All cost items are assigned to categories dependent on whether they are incurred because of vehicle size, travel, or weight. Costs within these categories are allocated on the basis of axle-miles, vehicle-miles, and ton-miles, respectively. The results of the cost-function solution are included in Appendix Tables 11 through 13 and are in general agreement with the findings of the incremental solution.

The theory behind the relative use approach to cost allocation, as contrasted with a differential cost approach, is that roads are built for mixed traffic and costs should, therefore, be shared. The two most commonly used measures of use are vehicle-miles and ton-miles, both of which may be used for allocating cost. However, the vehicle-mile allocation does not account for costs incurred by heavy weights, while in the ton-mile solution it is assumed that all costs are weight related. A compromise solution, obtained by averaging the two allocations, tends to reconcile the inherent differences and results in a more creditable distribution of tax responsibility. Shown in Appendix Tables 11 through 13 are the cost allocations by the vehicle-mile and ton-mile solutions as well as a compromise of these two solutions.

Comparison of User Tax Payments and Responsibility

New Jersey motor users pay taxes in various forms to the state. The average tax payments by each vehicle class have been calculated for comparison with cost responsibilities. Those state taxes paid and credited to vehicles include registration fees and motor fuel taxes.

The net tax payments by vehicle classes are compared in Table 68 with cost responsibility calculated on the basis of charges per vehicle. This comparison is illustrated in Figure 23 for trucks based on gross weight.

These comparisons indicate that almost all registration classes are generally underpaying their cost responsibility as determined by the incremental method while only lighter vehicles

TABLE 68

COMPARISON OF HIGHWAY-USER COST RESPONSIBILITY AND TAX PAYMENTS

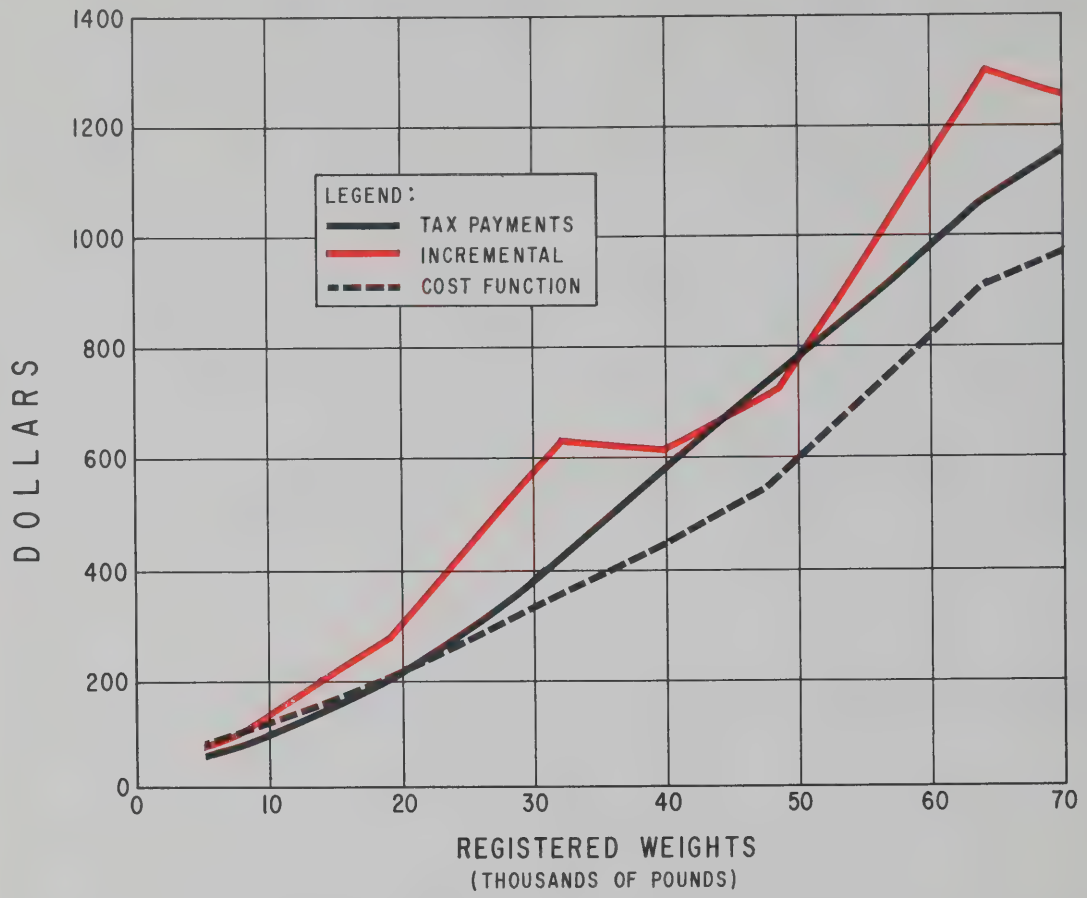
Annual Rates per Vehicle

New Jersey

1967-1986

REGISTRATION CLASS	TAX PAYMENT	INCREMENTAL ALLOCATION		COST-FUNCTION ALLOCATION	
		Cost Responsibility	Surplus or (Deficit) Payment	Cost Responsibility	Surplus or (Deficit) Payment
Passenger Cars	$ 56	$ 66	$ (10)	$ 74	$(18)
Buses	501	1,228	(727)	670	(169)
Trucks[1]					
2- 6	65	72	(7)	79	(14)
6-10	89	102	(13)	103	(14)
10-16	133	166	(33)	143	(10)
16-22	204	272	(68)	205	(1)
22-28	295	423	(128)	280	5
28-36	423	621	(198)	365	58
36-44	584	603	(19)	453	131
44-52	751	704	47	559	192
52-60	908	982	(74)	732	176
60-68	1,062	1,296	(234)	915	147
68-72	1,157	1,259	(102)	977	180

[1]Gross weight in thousands of pounds.



COST RESPONSIBILITY VERSUS TAX PAYMENTS

(PER VEHICLE)

NEW JERSEY

Wilbur Smith and Associates

FIGURE 23

are underpaying based on the cost-function solution. For passenger cars tax payments of $56 per year are $10 less than their incremental cost responsibility. Buses will pay $501 per vehicle or $727 less than their cost responsibility. For the lightest weight group of trucks, 2,000-6,000 pounds, tax payments of $65 will be $7 short of the cost responsibility assigned to this class by the incremental method. For the heaviest weight trucks, tax payments will average $1,157 or $102 less than their cost responsibility. These comparisons are based on the allocations by the incremental method. Also shown in Table 68 are the comparisons by the cost-function method.

Tax payments for buses and the middle weight groups of trucks have the greatest relative deficits in relation to their incremental cost responsibility. Buses will have average tax payments representing only 41 per cent of their incremental allocation. Tax payments for trucks between 16,000 to 36,000 pounds are 68 to 75 per cent of their cost responsibility. Trucks between 44,000 and 52,000 pounds gross weight have the highest relationship between tax payments and cost responsibility, at 107 per cent and are the only group with an overpayment. For automobiles, tax payments are 85 per cent of the cost responsibility assigned to them.

SUMMARY AND RECOMMENDATIONS

Chapter 8

New Jersey's transportation systems are not presently capable of meeting the travel demands placed upon them. The state's growing economy and population will place even further demands on now inadequate facilities. The growth of suburban areas envisioned over the next 20 years, with the attendant pressures for additional transportation facilities, will call for a concerted effort on the part of all governments involved if these needs are to be met.

Although this study is primarily concerned with highway transportation, it is obvious that mass transit and commuter problems loom large in New Jersey's future. Another and critical matter of concern to the Department of Transportation is the problem of the crowded airspace and the need for expansion of airline terminal facilities and of new facilities.

Present Status

New Jersey's highway, road, and street administrators have not, for many years, had fiscal resources adequate to cope with the ever-increasing demands of the highway users. As a result, the state and local units are faced with the need for accelerating their highway improvement programs to a substantial degree.

The highway administrators in the state have accomplished much within the fiscal restraints imposed upon them. The "jug-handle" intersections, traffic control devices, plus other innovations, have increased the capacity and utilization of highways far beyond normal expectations. The limit of such accomplishments has been reached and the state must now face up to the problem of costs of large-scale renovation and expansion of the highway systems.

Many traffic engineering measures have been used to improve the operation, safety, and capacity of existing highways. Concrete center barriers practically eliminate head-on collisions and are often used to convert undivided roads into dual highways and to ensure greater safety in locations where the median is too narrow for adequate protection. Jughandle turns are a New Jersey innovation to eliminate dangerous and traffic delaying left turns at intersections. However, the limit of such accomplishments is being reached and large-scale renovation and expansion is required.

For many years, the state has done little more in the construction of highways than that evolving from the matching of federal-aid highway funds. This has been far from sufficient. As an observation, the construction of three key facilities in the state as toll facilities probably saved the highway situation from being completely chaotic. There is probably a limit to how far toll roads can be employed to relieve intolerable traffic conditions.

The New Jersey highway user has for many years paid, in the form of highway-user taxes, substantially more than has been expended on highway programs in the state. As a general fund state with rather limited revenues, a substantial share of highway-user tax revenues were diverted to other uses, which in the judgment of legislators had as high a priority demand as highways on available economic resources. "The past is prologue," but it is believed that New Jersey's future economic growth will be highly dependent on adequate transportation. A 1959 survey of some 2,000 chemical manufacturing firms asking them to list the major factors they would consider in locating a new plant, showed that the availability of transportation ranked fourth in importance of 31 factors listed. Nearness to markets and availability of quality labor topped the list, while availability of raw material was barely higher than availability of transportation. All other factors rated far below the top four. As new and more sophisticated industries catering to local markets are developed, the nearness to raw materials has probably decreased in importance in recent years. This indicates rather strongly, however, the importance of the highway transportation system in New Jersey.

Functional Classification

In order to achieve a construction program for all highways, roads, and streets in the state, the adoption of the functional classification of the several systems is extremely important. Functional classification sorts out the various kinds of roads based on the character of service of each. Functional classification furnishes to highway administrators and legislators one of the basic and more important tools for establishing construction priority programs. *It is recommended that the functionally classified systems, as shown in this report, be adopted by the state.*

In recommending the adoption of functional classification, it is realized that the transfer of mileage between governmental units would be rather difficult if acted upon immediately. It is suggested that the transfers be implemented over an extended period and that some form of financial assistance be made available to those units adversely affected by the transfers. A further suggestion could be that, insofar as state roads transferred to the counties and municipalities are concerned, the state reconstruct and maintain such roads for a certain number of years after the administrative transfer has been made. This will make for an orderly implementation of the functional classification procedure and provide local governmental units the lead time needed to finalize the transfer.

Functional Classification Review Board

As no functionally classified systems of roads can be static and unresponsive to changing needs and economic growth, it is essential that the functionally classified systems be reviewed from time to time and revisions made in the systems as deemed desirable. To achieve this review, *it is recommended that a review board be formally established for this purpose.* The board, representing all levels of government, would be appointed by the governor and would meet at specified intervals for such reviews. This approach would give the functionally classified systems flexibility and responsiveness to changing demands. This is doubly important in New Jersey with its rapidly changing rural-urban complex.

Highway-User Tax Revenues

In 1966, gross state-collected highway-user tax revenues totaled $255,034,000, exclusive of federal-aid funds. In the same year, state appropriations for highway purposes totaled $108,650,000, including the state police. Therefore, about 43 per cent of the total gross state user tax revenues were expended for state highway purposes. Net revenues, after deducting administration costs and motor fuel tax refunds, totaled $222,692,000. So, of the total net-user

Highway users pay state taxes in the form of fuel taxes, registration fees, and numerous miscellaneous charges. In 1966, these tax revenues grossed $255,000,000 and were deposited in the state's general fund. Less than half of this amount was appropriated for highway improvement programs and the state police. If the total user revenues were made available for highway expenditure, significant measures could be undertaken to eliminate the tremendous backlog of highway needs. However, additional tax revenues would be required to replace such funds for other fiscal programs.

revenues, less than half were used for highway purposes.

The user revenues discussed above are exclusive of any toll revenues.

Highway Needs and Finance

The average annual needs of the recommended highway systems of New Jersey over the 20-year period total $587,195,200. Comparing average annual needs with the level of funds available in 1966, the annual deficits for recommended administrative systems would be $297,800,797.

This simply means that a continuation of the 1966 level of accomplishment 20-year deficits would total $5,956,015,940.

Funds necessary to meet such needs for state highways are subject to legislative appropriations as is the state aid for local roads. Therefore, a revenue-needs comparison is rather academic. For illustrative purposes, however, total annual needs are compared with average annual net highway-user and local tax revenues expected to be available during the 20-year program period.

It will be noted that average annual revenues from state and local sources do not equal needs. However, the addition of federal-aid

RECOMMENDED SYSTEMS	*AVERAGE ANNUAL NEEDS*	*1966 FUNDS AVAILABLE*	*DEFICIT*
State	$251,168,100	$165,828,000	$ 85,340,100
County	59,182,400	29,507,222	29,675,178
Municipal	276,844,700	94,059,181	182,785,519
TOTAL	$587,195,200	$289,394,403	$297,800,797

funds estimated at a level of approximately $108,000,000 during the 20-year period would provide sufficient revenues to finance the overall program.

The dedication of state highway-user tax revenues to highway purposes is, of course, the almost automatic answer to this problem. New Jersey is, however, a general fund state and it would not be practical to believe that this policy will change. The alternative to fund dedication, therefore, is the use of credit to finance the program.

State appropriations would be necessary for state highway maintenance, local road programs, and state police plus the amounts sufficient to meet annual debt service requirements of the state highway bonds. *It is recommended that the state embark on a long-range construction program to be financed by bond issues. Such issues would be full faith and credit obligations of the state.*

The construction program shown in Table 69 is illustrative of a possible approach to funding state highway needs. The proposal envisions a

TABLE 69

RECOMMENDED STATE HIGHWAY CONSTRUCTION PROGRAM

New Jersey

1967-1986

YEAR	FEDERAL AID			STATE CONSTRUCTION FUNDS	TOTAL CONSTRUCTION PROGRAMS
	ABC	Interstate	Subtotal		
			(millions)		
1967	$ 16.8	$ 78.1	$ 94.9	$ 56.8	$ 151.7
1968	16.8	88.9	105.7	49.8	155.5
1969	16.8	97.0	113.8	60.6	174.4
1970	16.8	105.1	121.9	71.4	193.3
1971	16.8	113.2	130.0	82.2	212.2
1972	16.8	121.4	138.2	92.9	231.1
1973	16.8	129.5	146.3	103.7	250.0
1974	94.6	12.5	107.1	169.2	276.3
1975	96.5	12.8	109.3	167.0	276.3
1976	98.5	13.1	111.6	164.7	276.3
1977	100.5	13.3	113.8	162.5	276.3
1978	102.4	13.6	116.0	160.4	276.4
1979	104.4	13.9	118.3	158.1	276.4
1980	106.4	14.1	120.5	155.9	276.4
1981	108.3	14.4	122.7	153.7	276.4
TOTAL 15 YEARS	$ 929.2	$ 840.9	$1,770.1	$1,808.9	$3,579.0
1982	110.3	14.7	125.0	56.8	181.8
1983	112.3	14.9	127.2	57.8	185.0
1984	114.3	15.1	129.4	58.8	188.2
1985	116.3	15.4	131.7	59.8	191.5
1986	118.2	15.7	133.9	60.8	194.7
TOTAL 20 YEARS	$1,500.6	$ 916.7	$2,417.3	$2,102.9	$4,520.2

continuation of federal aid generally following the recommendation of AASHO presented at the congressional hearings in 1967. This may not be the final basis for apportionments as it appears that there is a possibility that larger amounts for urban areas will be made available. However, for illustrative purposes, some projection of federal aid must be used.

It will be noted that state funds needed to finance the accelerated program total $1,808,900,000 for a 15-year program. As funds for the years 1967 and 1968 have already been appropriated, the state funds needed are reduced to $1,702,100,000.

REVENUES	*ANNUAL AVERAGE REVENUES (1967-1986)*
Highway-User Taxes (Net)	$315,917,000
Municipal Local Revenues	130,219,000
County Local Revenues	41,284,000
TOTAL	$487,420,000
Total Highway Needs (20-Year Annual Average)	$587,195,200

In devising the proposed construction program, the annual construction program was raised to about $276,000,000 by 1974 and held at that level through the remaining portion of the 15-year program. The last 5 years of the 20-year program are reduced substantially.

The bond issue program is based on the issuance of 30-year serial bonds having an interest rate of 4.75 per cent. The rate of interest may be somewhat high. This, plus the possibility that estimated federal-aid apportionments may be somewhat low, presents a fiscal program that probably provides a maximum cost to the state.

The proposed bond issue schedule is illustrated in Table 70. Annual debt service appropriations reach a peak of $124,017,000 in 1982 and decrease steadily thereafter. Total cost of the program will be slightly over $3,000,000,000. This is a substantial sum, but the results of the accelerated program in economic benefits, both direct and indirect, to the highway user and the general public will far outweigh the monetary costs. Furthermore, in an expanding economy, money borrowed today may well be repaid with dollars having less purchasing power. This possibility plus the steady rise in construction costs may result in the credit financing program being a very real bargain to the state.

The total annual program including all costs that might be considered as being highway oriented are shown in Table 71. To the costs of the proposed bond issues have been added the costs of maintenance, administration, state police, and the local road program. Costs other than construction have been included so that direct comparisons with projected highway-user tax revenues can be made.

It will be noted that annual appropriations reach a peak of $250,000,000 in 1981 and 1984, the latter year being the end of the accelerated 15-year program. The years 1967 and 1968 are not included in the tabulation for reasons mentioned. It might also be noted that the peak appropriations required do not equal the 1966 gross highway-user tax revenues collected by the state.

A year-by-year comparison of annual appropriations and anticipated highway-user tax revenues is shown in Table 72. It will be noted that tax payments are greater than annual appropriations in all cases.

Highway Cost Allocation

In conducting the highway cost allocation analyses to determine the split between user and nonuser and the tax responsibility of the several classes of users, it was determined that highway users should be assigned 72.8 per cent of the total program cost. The allocation of cost responsibility among the several classes of users by the incremental method shows that the user, in total, is paying somewhat less than the costs allocated.

Although the cost allocation analyses are precise in theory, the precision is somewhat diffused by the data which are used in the conduct of the analyses. The data are vari-

TABLE 70

15-YEAR PROPOSED BOND ISSUE PROGRAM

State Highway System

New Jersey

1969-2011

BOND ISSUE PROGRAM AT 4.750 PER CENT

YEAR	AMOUNT ISSUED	ANNUAL INTEREST	AMOUNT RETIRED	TOTAL DEBT SERVICE	TOTAL OUTSTANDING
1969	$ 61,000,000.00	$ 2,897,500.00	$ .00	$ 2,897,500.00	$ 61,000,000.00
1970	71,000,000.00	6,270,000.00	2,033,333.33	8,303,333.33	129,966,666.67
1971	82,000,000.00	10,068,416.64	4,400,000.00	14,468,416.64	207,566,666.67
1972	93,000,000.00	14,276,916.64	7,133,333.33	21,410,249.97	293,433,333.34
1973	104,000,000.00	18,878,083.28	10,233,333.33	29,111,416.61	387,200,000.01
1974	169,000,000.00	26,419,499.91	13,700,000.00	40,119,499.91	542,500,000.01
1975	167,000,000.00	33,701,249.96	19,333,333.33	53,034,583.29	690,166,666.68
1976	165,000,000.00	40,620,416,56	24,900,000.00	65,520,416.56	830,266,666.68
1977	163,000,000.00	47,180,166.50	30,400,000.00	77,580,166.50	962,866,666.68
1978	160,000,000.00	53,336,166.60	35,833,333.33	89,169,499.93	1,087,033,333.35
1979	158,000,000.00	59,139,083.15	41,166,666.66	100,305,749.81	1,203,866,666.69
1980	156,000,000.00	64,593,666.46	46,433,333.33	111,026,999.79	1,313,433,333.36
1981	154,000,000.00	69,703,083.24	51,633,333.33	121,336,416.57	1,415,800,000.03
1982	.00	67,250,499.79	56,766,666.66	124,017,166.45	1,359,033,333.37
1983	.00	64,554,083.05	56,766,666.66	121,320,749.71	1,302,266,666.71
1984	.00	61,857,666.56	56,766,666.66	118,624,333.22	1,245,500,000.05
1985	.00	59,161,249.79	56,766,666.66	115,927,916.45	1,188,733,333.39
1986	.00	56,464,833.05	56,766,666.66	113,231,499.71	1,131,966,666.73
1987	.00	53,768,416.56	56,766,666.66	110,535,083.22	1,075,200,000.07
1988	.00	51,071,999.79	56,766,666.66	107,838,666.45	1,018,433,333.41
1989	.00	48,375,583.05	56,766,666.66	105,142,249.71	961,666,666.75
1990	.00	45,679,166.56	56,766,666.66	102,455,833.22	904,900,000.09
1991	.00	42,982,749.79	56,766,666.66	99,749,416.45	848,133,333.43
1992	.00	40,286,333.05	56,766,666.66	97,052,999.71	791,366,666.77
1993	.00	37,589,916.56	56,766,666.66	94,356,583.22	734,600,000.11
1994	.00	34,893,499.79	56,766,666.66	91,660,166.45	677,833,333.45
1995	.00	32,197,083.05	56,766,666.66	88,963,749.71	621,066,666.79
1996	.00	29,500,666.56	56,766,666.66	86,267,333.22	564,300,000.13
1997	.00	26,804,249.79	56,766,666.66	83,570,916.45	507,533,333.47
1998	.00	24,107,833.05	56,766,666.66	80,874,499.71	450,766,666.81
1999	.00	21,411,416.56	56,766,666.76	78,178,083.32	394,000,000.05
2000	.00	18,714,999.79	54,733,333.23	73,448,333.02	339,266,666.82
2001	.00	16,115,166.46	52,366,666.76	68,481,833.22	286,900,000.06
2002	.00	13,627,749.92	49,633,333.33	63,261,083.25	237,266,666.73
2003	.00	11,270,166.51	46,533,333.23	57,803,499.74	190,733,333.50
2004	.00	9,059,833.19	43,066,666.76	52,126,499.95	147,666,666.74
2005	.00	7,014,166.60	37,433,333.23	44,447,499.83	110,233,333.51
2006	.00	5,236,083.28	31,866,666.66	37,102,749.94	78,366,666.85
2007	.00	3,722,416.55	26,366,666.76	30,089,083.31	52,000,000.09
2008	.00	2,469,999.96	20,933,333.43	23,403,333.39	31,066,666.66
2009	.00	1,475,666.64	15,599,999.90	17,075,666.54	15,466,666.76
2010	.00	734,666.64	10,333,333.33	11,067,999.97	5,133,333.43
2011	.00	243,833.32	5,133,333.43	5,377,166.75	.00
	$1,703,000,000.00	$1,334,726,244.20	$1,703,000,000.00	$3,037,726,244.20	

TABLE 71

ESTIMATED ANNUAL STATE APPROPRIATIONS NEEDED FOR FINANCING PROPOSED HIGHWAY PROGRAM

New Jersey

1969-1986

YEAR	MAINTE-NANE	ADMINI-STRATION	STATE POLICE	DEBT SERVICE	STATE-AID PROGRAM	TOTAL APPROPRI-ATIONS[1]
			(millions)			
1969	$20.5	$21.5	$14.5	$ 2.9	$15.0	$ 74.8
1970	21.6	23.8	15.0	8.3	20.0	88.7
1971	22.8	26.0	15.5	14.5	25.0	103.8
1972	23.9	28.2	16.0	21.4	30.0	119.5
1973	25.0	30.4	16.5	29.1	35.0	136.0
1974	26.1	33.4	17.0	40.1	40.0	154.6
1975	27.2	33.6	17.5	53.0	40.0	171.3
1976	28.4	33.7	18.0	65.5	40.0	185.6
1977	29.5	33.8	18.5	77.6	40.0	199.4
1978	30.6	33.9	19.0	89.2	40.0	212.7
1979	31.7	34.1	19.5	100.3	40.0	225.6
1980	32.8	34.2	20.0	111.0	40.0	238.0
1981	33.9	34.3	20.5	121.3	40.0	250.0
1982	34.4	23.8	21.0	124.0	40.0	243.2
1983	34.9	24.2	21.5	121.3	40.0	241.9
1984	35.4	24.6	22.0	118.6	50.0	250.6
1985	36.0	25.0	22.5	115.9	50.0	249.4
1986	36.5	25.4	23.0	113.2	50.0	248.1

[1]Total appropriations include amounts necessary to match federal-aid highway funds.

able, many of which are logical or consequential, but the effect on cost allocation analyses is sometimes difficult to evaluate. As an example, all cost allocation analyses are based on average annual costs for the program period. In New Jersey, however, the growth in urbanization will cause a shift of almost 4,000 miles from rural to urban classification during the study period. This causes the average annual needs of the municipal system to increase quite rapidly, far beyond what would normally be anticipated and results in some bias in the allocation results. Also, the very high traffic estimates on local access facilities have a considerable influence on results of the analyses.

If it is assumed that the legislature will appropriate additional funds for the modernization program, it must also be assumed that at least a portion of the additional revenues required from the general fund must be replaced. *Therefore, it is recommended that the state motor fuel tax rate be increased from 6 cents to 7 cents per gallon.* It is true that under the present general fund policy, a substantial portion of highway-user tax revenues are appropriated for nonhighway purposes. Nonetheless, a 1-cent increase in the motor fuel tax rate will realize approximately $680,000,000 over the 20-year period. An additional cent in fuel tax rates will, conservatively estimated, result in additional revenues sufficient to retire the $1,683,000,000 of bonds issued for the program over the 43-year period, 1969-2011.

TABLE 72

COMPARISON ANNUAL HIGHWAY-USER TAX REVENUES AND REQUIRED APPROPRIATIONS

New Jersey

1969-1986

YEAR	TOTAL HIGHWAY-USER REVENUES[1]	REVENUE FROM 1 CENT ADDITIONAL FUEL TAX	TOTAL ESTIMATED REVENUES	REQUIRED APPROPRIATIONS
		(millions)		
1969	$249.3	$ 27.7	$277.0	$ 74.8
1970	258.2	28.2	286.4	88.7
1971	267.1	29.2	296.3	103.8
1972	276.0	30.2	306.2	119.5
1973	284.8	31.3	316.1	136.0
1974	293.7	32.3	326.0	154.0
1975	302.6	33.3	335.9	171.3
1976	311.5	34.3	345.8	185.6
1977	320.4	35.3	355.7	199.4
1978	329.2	36.4	365.6	212.7
1979	338.1	37.4	375.5	225.6
1980	347.0	38.4	385.4	238.0
1981	355.9	39.4	395.3	250.0
1982	364.7	40.5	405.2	243.2
1983	373.6	41.5	415.1	241.9
1984	382.5	42.5	425.0	250.6
1985	391.4	43.5	434.9	249.4
1986	400.3	44.5	444.8	248.1

[1]State motor fuel taxes and registration fees.

Advance Right-of-Way Acquisition

As the proposed construction program includes the costs of rights-of-way, it is assumed that the state will purchase the needed property well in advance of actual construction. Again, it should be noted that substantial portions of the state now considered as rural will be highly urbanized during the last half or at least the last 5 years of the 20-year program. *Therefore, it is recommended that the state purchase the needed rights-of-way as far in advance as is reasonably feasible.* This is especially critical in the recommended construction of Class I Major Highways. Delays in purchasing the necessary property until areas are urbanized would probably make the cost prohibitive. The acceleration of advance right-of-way acquisitions can be easily adapted to a credit financing program as bonds can be issued as needed, or, alternatively, appropriations for this purpose can be made.

County Highway Program

The average annual requirements for funds to bring the county highway system up to acceptable standards in 20 years exceeds the estimated funds available from present sources. With average annual needs in excess of $59,000,000, and projected combined resources from county funds of approximately $41,300,000

TABLE 73

COMPARATIVE 20-YEAR AVERAGE ANNUAL NEEDS AND REVENUES

Recommended County Highway System

New Jersey

1967-1986

Average Annual Needs		$59,182,400
Less:		
Average Annual County Revenues	$41,284,000	
Average Annual State Aid	11,000,000	
Average Annual Revenues		52,284,000
Average Annual Deficit		$ 6,898,400

and state-aid monies of $11,000,000, the estimated average deficit will equal almost $7,000,000 annually.

Although the annual deficit is significant, it is not without solution. A reasonable increase in state aid to county highways, coupled with an equal increase from local revenue sources, will produce a practical answer to achieving the goal of an adequate county highway network within the study period. Table 73 presents the relationship between the average annual needs for the 20-year county highway program and the estimated future revenues from present sources, assuming a continuation of present tax rates and policies.

Municipal Road and Street Program

The needs for modernizing the municipal road and street system, when compared to the estimated funds available from normal sources over the 20-year program period to 1986, present a recurring annual deficit of critical magnitude. Average annual 20-year needs on the municipal system reach almost $277,000,000, while estimated funds available annually will meet only $135,200,000 of these needs. The resulting deficit amounts to more than $141,500,000 annually. Table 74 illustrates the comparison of need and revenues.

A very large segment of the average annual needs on the municipal system will be created as new arterial streets will be required, and residential street facilities built by others in the expanding urban areas will become municipal responsibilities. The assumption must be made that there will be a reasonably commensurate increase in the tax bases in these expanding urban areas, as the total value of ratable land grows with the residential and commercial construction which will occur.

Two alternatives are available to meet the annual deficits. First, the combined available funds derived from state-aid and local revenues can be increased to offset the deficit. Second, consideration can be given to credit financing through the device of long-term general obligation state bonds to provide state-aid funds equal to the adjusted deficit, after optimum local revenue sources have been marshaled. The indebtedness duration should be of sufficient length to permit a reasonable and manageable annual debt service.

Of the principal alternatives suggested above, neither offers an easy solution. However, the strangulation of New Jersey's economy that will result from a continued tolerance of an inadequate transportation system must be met with immediate and far-reaching measures.

TABLE 74

COMPARATIVE 20-YEAR AVERAGE ANNUAL NEEDS AND REVENUES

Recommended Municipal System

New Jersey

1967-1986

Average Annual Needs		$276,844,700
Less:		
Average Annual Local Revenues	$130,219,000	
Average Annual State Aid	5,000,000	
Average Annual Revenues		135,219,000
Average Annual Deficit		$141,625,700

Because of the very great size of the annual municipal needs, and the critical deficit which will recur each year, a priority program to select the facilities eligible for improvement in the early years is mandatory. Such a program should be predicated on the principle of improving first those facilities which will return the greatest benefits to the public. At the base of such a program should be the considerations of predominant trip type, traffic volume, and safety.

Traffic Operations Programs

The determinations of identified urban street needs, as presented in this report, were made after assuming that all practical operational improvements would first be made, in order to minimize the requirements for urban street construction, utilizing such devices as the removal of parking and the implementation of additional one-way street couplets. In the absence of such assumptions, the identified urban needs would have been substantially greater and would not have represented a realistic and practical appraisal of this problem.

In view of the very substantial identified needs on urban arterial streets under all administrative jurisdictions, and the critical need for traffic operational improvements in urban areas, *it is recommended that the New Jersey Department of Transportation assume the leadership in sponsoring comprehensive traffic operational improvement programs in all urban areas.* Such programs must be fully cooperative efforts, utilizing the talents and resources available at all governmental levels, in order that travel demands can be met with the most efficient use of existing urban street facilities.

Recommendations

The recommended actions believed necessary for the state to solve its acute highway problems are summarized below:

- Adopt the 15-year construction program for state highways.
- Accelerate the state highway program by use of credit financing.
- Increase the motor fuel tax rate to 7 cents per gallon.
- Establish the annual appropriations of the legislature at a level commensurate with the annual debt service payments, highway maintenance and administration costs, state police, and an accelerated state-aid program for local units.

The programs outlined for New Jersey envision the development of highway, road, and street systems to a level commensurate with the requirements of motor-vehicle traffic and the general economy. Economic growth of the state will be benefitted by improved highway facilities which will move people and goods with speed, safety, and convenience.

- Adopt the recommended functionally classified highway systems.
- Provide for establishing a functional classification review board.
- Provide for the purchase of rights-of-way as far in advance as is determined feasible.
- Adopt a 20-year program for the counties and muncipalities, with substantial increases in state-aid funds.
- Initiate, as soon as possible, a comprehensive and cooperative traffic improvements program for arterial streets in urban areas.

Other Considerations — Those other items, not included in the scope of this study, should be given very serious consideration by the Department of Transportation. These items are the provision for a continuing needs appraisal program, establishment of a priority program, and the problem of adequate parking in urban areas.

Continuing Study Processes

This study has provided the basis for the recommendations which will serve as guidelines for building highway programs designed to provide adequate facilities for future traffic demands in New Jersey. However, the programs developed in this study are subject to revision since unanticipated economic changes may occur. Technical changes in modes of transport, vehicles characteristics, and operational characteristics of highway equipment may also require alteration of the programs. Therefore, a system for continually updating the present study should be adopted. In addition, further analysis of the data gathered and developed in this study should be conducted so that maxi-

mum utilization of such data is obtained. This should include procedures and programs to implement an orderly transfer of mileage between the various systems in conformance with the findings of the functional classification study. In addition, development of priority improvement programs should be accomplished to ensure the most efficient expenditure of funds. Finally, a program of fiscal planning should be established to make optimum use of available funds.

Priority Improvement Program — The results of this study have indicated that the various highway agencies will be unable to meet the needs on the various systems if additional revenues are not forthcoming. This, however, does not obviate the expenditures of available resources on construction projects which would provide the greatest benefits to users. A construction priority program provides the various highway departments with the necessary apparatus for selecting the projects for construction which will result in the greatest economic returns to the unit of government, the highway users, and the public in general.

Priority programming for highway development may be defined as the rational selection of improvement projects on the basis of factual need, scheduled within limits of available money and manpower, to meet established policy objectives.

Functional highway classification should strongly influence highway improvement programs. As has been shown, some roads are more important than others in terms of highway travel. The highway improvement program must take these differences into account. The greatest effort should be made to improve and maintain the more important facilities. The classes and systems established herein provide the best basis for long-range and short-range planning, budgeting, and scheduling of work — separately for each class — within limits of funds available each year.

A prime goal should be to provide for acceleration of construction on those routes of greatest functional importance, while taking care of the most essential needs on routes of lesser importance. Within funds available for a given period, there are numerous budget allocation possibilities, depending on how fast it is desired to develop each functional class and upon the needs of each class.

Urban-rural balance must be achieved in both budget allocations and highway improvement programs. The long-range needs of each functional class should guide budget allocations within the broader policy objectives and goals for development of each functional class — statewide.

Within each functional class, improvement projects should be scheduled generally in order of urgency. The ranking should be based on: (1) engineering evaluations of structural condition, (2) traffic congestion, (3) geometrics, (4) safety features, and (5) economic justification of projects.

The actual program adopted depends also on the time required and the rate of expenditure for construction projects, as well as how long it may take to produce plans and acquire right-of-way for each project. A systematic scheduling procedure should be adopted to estimate future availability and practical utilization of both manpower and money. At the same time, an effective reporting, control, and scheddule adjustment procedure is vital for efficient highway management and to ensure reasonable adherence to planned programs.

Other considerations that influence project selection include need for continuity in route development, legal requirements, limitations in use of federal funds, and emergencies arising from conditions beyond control of the various highway agencies. The final program should then be evaluated to determine how well it meets the original basic objectives set for functional class development, and adjustments should be made if necessary. Re-evaluation will be required periodically.

Parking

During the computation of urban arterial street capacities, the assumption was made that all parking would be eliminated and the full existing pavement widths would be utilized for traveled lanes before any consideration would be given to widening existing streets. This ap-

proach permitted the realization of the most efficient usage of past capital investments, and a realistic appraisal of the costs for needed improvements.

However, while the assumption that parking would be eliminated from such arterial facilities represents the soundest engineering approach to a problem of staggering magnitude, the implementation of it will create a substantial need for additional parking facilities. Consideration should be given to a joint effort by state and local governments aimed at a program of developing self-supporting off-street parking spaces. Because such facilities in densely urbanized areas, if properly developed and administered, do not represent a drain on public funds, no funding needs have been estimated in this report.

It is believed that the adoption of these recommendations would provide New Jersey with a highway system fully capable of meeting future travel demands. It is also believed that failure to take positive and immediate action will result in an irreparable loss to the efficiency of the highway transportation system of the state and economic losses to the entire state which can never be fully recovered.

The state has approached its highway problems at an inadequate fiscal level for many years. The time for action has long passed. *An accelerated and adequately financed program can do much to overcome past years of inadequate financing, but positive action must be taken very soon or it will be extremely difficult, if not impossible, for the state to meet future highway transportation demands.*

Appendix

APPENDIX TABLE 1

RURAL TOLERABLE GEOMETRIC CONDITIONS FOR NEEDS ANALYSIS

New Jersey

LINE	DESIGN ITEM	CLASS I MAJOR HIGHWAY				
1	Tolerable Criteria Number	1	2	3	4	5
2	Traffic Volume[1]	10,000-12,000	8,000-10,000	6,000-8,000	4,000-6,000	Under 4,000
3	Access Control	Full	Full	Full	Full	Full
4	Number of Lanes	12	10	8	6	4
5	Pavement Width (feet)	4 @ 33	2 @ 33, 2 @ 22	4 @ 22	2 @ 33	2 @ 22
6	Pavement Type	Paved	Paved	Paved	Paved	Paved
7	Shoulder Width (feet)[2]	8	8	8	8	8
8	Shoulder Type	Paved	Paved	Paved	Paved	Paved
9	Min. Stopping Sight Distance (feet)[3]	475-350	475-350	475-350	475-350	475-350
10	Maximum Curvature (degrees)[4]	5.0-7.5	5.0-7.5	5.0-7.5	5.0-7.5	5.0-7.5
11	Maximum Gradient (per cent)[4]	3-7	3-7	3-7	3-7	3-7
12	Safe Loading	H20	H20	H20	H20	H20
13	Structure Width (feet)					
14	Short Structures[5]	4 @ 33	2 @ 33, 2 @ 22	4 @ 22	2 @ 33	2 @ 22
15	Long Structures[5]	4 @ 33	2 @ 33, 2 @ 22	4 @ 22	2 @ 33	2 @ 22
16	Horizontal Clearance (feet)	3	3	3	3	3
17	Vertical Clearance (feet)	14	14	14	14	14
18	Railroad Protection	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.

APPENDIX TABLE 1 (Continued)

LINE	DESIGN ITEM	CLASS II MAJOR HIGHWAY				
1	Tolerable Criteria Number	6	7	8	9	10
2	Traffic Volume[1]	9,000-10,800	7,200-9,000	5,400-7,200	3,600-5,400	Under 3,600
3	Access Control	Partial	Partial	Partial	Partial	Partial
4	Number of Lanes	12	10	8	6	4
5	Pavement Width (feet)	4 @ 33	2 @ 33, 2 @ 22	4 @ 22	2 @ 33	2 @ 22
6	Pavement Type	Paved	Paved	Paved	Paved	Paved
7	Shoulder Width (feet)[2]	8	8	8	8	8
8	Shoulder Type	Paved	Paved	Paved	Paved	Paved
9	Min. Stopping Sight Distance (feet)[3]	475-350	475-350	475-350	475-350	475-350
10	Maximum Curvature (degrees)[4]	5.0-7.5	5.0-7.5	5.0-7.5	5.0-7.5	5.0-7.5
11	Maximum Gradient (per cent)[4]	3-7	3-7	3-7	3-7	3-7
12	Safe Loading	H20	H20	H20	H20	H20
13	Structure Width (feet)					
14	Short Structures[5]	4 @ 33	2 @ 33, 2 @ 22	4 @ 22	2 @ 33	2 @ 22
15	Long Structures[5]	4 @ 33	2 @ 33, 2 @ 22	4 @ 22	2 @ 33	2 @ 22
16	Horizontal Clearance (feet)	3	3	3	3	3
17	Vertical Clearance (feet)	14	14	14	14	14
18	Railroad Protection	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.

Appendix Table 1 (Continued)

LINE	DESIGN ITEM	AREA SERVICE HIGHWAYS			
1	Tolerable Criteria Number	11	12	13	14
2	Traffic Volume[1]	4,800-6,400	3,200-4,800	1,000-3,200	Under 1,000
3	Access Control	None	None	None	None
4	Number of Lanes	8	6	4	2
5	Pavement Width (feet)	4 @ 22	2 @ 33	2 @ 20	20
6	Pavement Type	Paved	Paved	Paved	Paved
7	Shoulder Width (feet)[2]	8	8	8	8
8	Shoulder Type	Sod	Sod	Sod	Sod
9	Min. Stopping Sight Distance (feet)[3]	350-275	350-275	350-275	350-275
10	Maximum Curvature (degrees)[4]	7.5-12.5	7.5-12.5	7.5-12.5	7.5-12.5
11	Maximum Gradient (per cent)[4]	4-8	4-8	4-8	4-8
12	Safe Loading	H20	H20	H20	H20
13	Structure Width (feet)				
14	Short Structures[5]	4 @ 22	2 @ 33	2 @ 20	20
15	Long Structures[5]	4 @ 22	2 @ 33	2 @ 20	20
16	Horizontal Clearance (feet)	3	3	3	3
17	Vertical Clearance	14	14	14	14
18	Railroad Protection	[6]	[6]	[6]	[6]

Appendix Table 1 (Continued)

LINE	DESIGN ITEM	COLLECTOR HIGHWAY		
1	Tolerable Criteria Number	15	16	17
2	Traffic Volume[1]	1,000-3,200	400-1,000	Under 400
3	Access Control	None	None	None
4	Number of Lanes	4	2	2
5	Pavement Width (feet)	2 @ 20	20	20
6	Pavement Type	Paved	Paved	Paved
7	Shoulder Width (feet)[2]	4	4	4
8	Shoulder Type	Sod	Sod	Sod
9	Min. Stopping Sight Distance (feet)[3]	350-275	350-275	275-200
10	Maximum Curvature (degrees)[4]	7.5-12.5	7.5-12.5	12.5-23.0
11	Maximum Gradient (per cent)[4]	4-8	4-8	5-9
12	Safe Loading	H20	H20	H20
13	Structure Width (feet)			
14	Short Structures[5]	2 @ 20	20	20
15	Long Structures[5]	2 @ 20	20	20
16	Horizontal Clearance (feet)	3	3	3
17	Vertical Clearance (feet)	14	14	14
18	Railroad Protection	[6]	[6]	[6]

APPENDIX TABLE 1 (Continued)

LINE	DESIGN ITEM	LAND ACCESS ROAD			
1	Tolerable Criteria Number	18	19	20	21
2	Traffic Volume[1]	1,000 and Over	500-1,000	100-500	Under 100
3	Access Control	None	None	None	None
4	Number of Lanes	2	2	2	2
5	Pavement Width (feet)	20	18	18	16
6	Pavement Type	Paved	Paved	Paved	Aggregate
7	Shoulder Width (feet)[2]	4	3	3	3
8	Shoulder Type	Sod	Sod	Sod	Sod
9	Min. Stopping Sight Distance (feet)[3]	275-200	200	200	200
10	Maximum Curvature (degrees)[4]	12.5-23.0	23.0	23.0	23.0
11	Maximum Gradient (per cent)[4]	5-9	6	6	6
12	Safe Loading	H15	H15	H10	H10
13	Structure Width (feet)				
14	Short Structures[5]	20	18	18	16
15	Long Structures[5]	20	18	18	16
16	Horizontal Clearance (feet)	3	2	2	2
17	Vertical Clearance (feet)	14	13	12	12
18	Railroad Protection	[6]	[6]	Refl. Signs	Refl. Signs

[1]Traffic volumes in terms of Design Hourly Volumes for tolerable conditions 01-17 and average daily traffic for tolerable conditions 18-21.

[2]For divided highways inside shoulders should be 2 feet for 2-lane and 3-lane sections.

[3]Higher value is for flat and rolling terrain. Lower value for mountainous terrain.

[4]Lower value is for flat and rolling terrain. Higher value for mountainous terrain.

[5]Difference between long and short structures: 250 feet for tolerable conditions 01-15; 150 feet for tolerable conditions 16-19; 50 feet for tolerable conditions 20 and 21.

[6]Grade separate where ADT × Trains (min. 6) equals 100,000 or more. Flashing lights and gates for 5,000-100,000. Flashing lights for 1,500-5,000. Reflectorized signs below 1,500.

APPENDIX TABLE 2

URBAN TOLERABLE GEOMETRIC CONDITIONS FOR NEEDS ANALYSIS

New Jersey

LINE	DESIGN ITEM	CLASS I MAJOR HIGHWAY				
1	Tolerable Criteria Number	31	32	33	34	35
2	Traffic Volume – DHV	15,000-18,000	12,000-15,000	9,000-12,000	6,000-9,000	Under 6,000
3	Access Control	Full	Full	Full	Full	Full
4	Number of Lanes	12	10	8	6	4
5	Pavement Width (feet)	4 @ 33	2 @ 33, 2 @ 22	4 @ 22	2 @ 33	2 @ 22
6	Pavement Type	Paved	Paved	Paved	Paved	Paved
7	Shoulder Width (feet)[1]	8	8	8	8	8
8	Shoulder Type	Paved	Paved	Paved	Paved	Paved
9	Min. Stopping Sight Distance (feet)	350	350	350	350	350
10	Maximum Curvature (degrees)	7.5	7.5	7.5	7.5	7.5
11	Maximum Gradient (per cent)	4	4	4	4	4
12	Safe Loading	H20	H20	H20	H20	H20
13	Structure Width (feet)[2]					
14	Short Structures	4 @ 33	2 @ 33, 2 @ 22	4 @ 22	2 @ 33	2 @ 22
15	Long Structures	4 @ 33	2 @ 33, 2 @ 22	4 @ 22	2 @ 33	2 @ 22
16	Horizontal Clearance (feet)	3	3	3	3	3
17	Vertical Clearance (feet)	14	14	14	14	14
18	Railroad Protection	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.

APPENDIX TABLE 2 (Continued)

LINE	DESIGN ITEM	PRIMARY THOROUGHFARE[3]				
1	Tolerable Criteria Number	36	37	38	39	40
2	Traffic Volume – DHV	10,000-12,000	8,000-10,000	6,000-8,000	4,000-6,000	Under 4,000
3	Access Control	Partial	Partial	Partial	Partial	Partial
4	Number of Lanes	12	10	8	6	4
5	Pavement Width (feet)	4 @ 33	2 @ 33, 2 @ 22	4 @ 22	2 @ 33	2 @ 22
6	Pavement Type	Paved	Paved	Paved	Paved	Paved
7	Shoulder Width (feet)[1]	8	8	8	8	8
8	Shoulder Type	Sod	Sod	Sod	Sod	Sod
9	Min. Stopping Sight Distance (feet)	275	275	275	275	275

APPENDIX TABLE 2 (Continued)

LINE	DESIGN ITEM	PRIMARY THOROUGHFARE[3]				
10	Maximum Curvature (degrees)	12.5	12.5	12.5	12.5	12.5
11	Maximum Gradient (per cent)	5	5	5	5	5
12	Safe Loading	H20	H20	H20	H20	H20
13	Structure Width (feet)[2]					
14	Short Structures	4 @ 33	2 @ 33, 2 @ 22	4 @ 22	2 @ 33	2 @ 22
15	Long Structures	4 @ 33	2 @ 33, 2 @ 22	4 @ 22	2 @ 33	2 @ 22
16	Horizontal Clearance (feet)	3	3	3	3	3
17	Vertical Clearance (feet)	14	14	14	14	14
18	Railroad Protection	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.

APPENDIX TABLE 2 (Continued)

LINE	DESIGN ITEM	COMMERCIAL ACCESS			RESIDENTIAL ACCESS
1	Tolerable Criteria Number	49	50	51	52
2	Traffic Volume – DHV	[4]	[4]	[4]	–
3	Access Control	None	None	None	None
4	Number of Lanes	6	4	2	2
5	Pavement Width (feet)	54	36	18	20
6	Pavement Type	Paved	Paved	Paved	Paved
7	Shoulder Width (feet)[1]	–	–	–	–
8	Shoulder Type	–	–	–	–
9	Min. Stopping Sight Distance (feet)	–	–	–	–
10	Maximum Curvature (degrees)	–	–	–	–
11	Maximum Gradient (per cent)	–	–	–	–
12	Safe Loading	H20	H20	H20	H10
13	Structure Width (feet)[2]				
14	Short Structures	[5]	[5]	[5]	20
15	Long Structures	[5]	[5]	[5]	20
16	Horizontal Clearance (feet)	1	1	1	1
17	Vertical Clearance (feet)	13	13	13	12
18	Railroad Protection	[6]	[6]	[6]	[6]

Appendix Table 2 (Continued)

LINE	DESIGN ITEM	PRIMARY THOROUGHFARE[3]				SECONDARY THOROUGHFARE[3]			
1	Tolerable Criteria Number	41	42	43	44	45	46	47	48
2	Traffic Volume — DHV	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]
3	Access Control	None	None	None	None	None	None	None	None
4	Number of Lanes	8	6	4	2	8	6	4	2
5	Pavement Width (feet)	72	54	36	18	72	54	36	18
6	Pavement Type	Paved	Paved	Paved	Paved	Paved	Paved	Paved	Paved
7	Shoulder Width (feet)[1]	—	—	—	—	—	—	—	—
8	Shoulder Type	—	—	—	—	—	—	—	—
9	Min. Stopping Sight Distance (feet)	200	200	200	200	200	200	200	200
10	Maximum Curvature (degrees)	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
11	Maximum Gradient (per cent)	6	6	6	6	6	6	6	6
12	Safe Loading	H20	H20	H20	H20	H20	H20	H20	H20
13	Structure Width (feet)[2]								
14	Short Structures	[5]	[5]	[5]	[5]	[5]	[5]	[5]	[5]
15	Long Structures	[5]	[5]	[5]	[5]	[5]	[5]	[5]	[5]
16	Horizontal Clearance (feet)	2	2	2	2	2	2	2	2
17	Vertical Clearance (feet)	14	14	14	14	14	14	14	14
18	Railroad Protection	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]

[1]For divided highways inside shoulders should be 2 feet for 2-lane and 3-lane sections.

[2]Short structures — under 50 feet. Long structures — over 50 feet.

[3]For Class II Major Highway and Area Service extensions use conditions for Primary Thoroughfares. For Collector Highway extensions use standards for Primary Thoroughfares or Secondary Thoroughfares, whichever is applicable.

[4]Pavement widths must be adequate for traffic during study period at tolerable capacity.

[5]Structure width is tolerable if equal to tolerable pavement width (through lanes only).

[6]Flashing lights.

[7]Grade separate where ADT × Trains (min. 6) equals 200,000 or more. Flashing lights and gates for 5,000-200,000. Flashing lights for under 5,000.

APPENDIX TABLE 3

RURAL DESIGN STANDARDS FOR NEEDS ANALYSIS

New Jersey

LINE	DESIGN ITEM	CLASS I MAJOR HIGHWAY				
1	Design Standard Number	1	2	3	4	5
2	Traffic Volume[1]	8,500-10,200	6,800-8,500	5,100-6,800	3,400-5,100	Under 3,400
3	Access Control	Full	Full	Full	Full	Full
4	Design Speed (mph)[2]	80	80	80	80	80
5	Right-of-Way Width (feet)	300	300	300	200	200
6	Number of Lanes	12	10	8	6	4
7	Pavement Width (feet)	4 @ 36	2 @ 36, 2 @ 24	4 @ 24	2 @ 36	2 @ 24
8	Pavement Type	High	High	High	High	High
9	Shoulder Width (feet)[3]	12	12	12	12	12
10	Shoulder Type	Paved	Paved	Paved	Paved	Paved
11	Median Width (feet)[4]	46-18	46-30	70-30	70	94
12	Min. Stopping Sight Distance (feet)	750	750	750	750	750
13	Maximum Curvature (degrees)	2.5	2.5	2.5	2.5	2.5
14	Maximum Gradient (per cent)[5]	3	3	3	3	3
15	Safe Loading	H20-S16	H20-S16	H20-S16	H20-S16	H20-S16
16	Structure Width (feet)					
17	Short Structures[6]	248	212	176	124	88
18	Long Structures[6]	248	212	176	124	88
19	Horizontal Clearance (feet)[7]	12	12	12	12	12
20	Vertical Clearance	14'-6"	14'-6"	14'-6"	14'-6"	14'-6"
21	Railroad Protection	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.

APPENDIX TABLE 3 (Continued)

LINE	DESIGN ITEM	CLASS II MAJOR HIGHWAY				
1	Design Standard Number	6	7	8	9	10
2	Traffic Volume[1]	7,500-9,000	6,000-7,500	4,500-6,000	3,000-4,500	Under 3,000
3	Access Control	Partial	Partial	Partial	Partial	Partial
4	Design Speed (mph)[2]	70	70	70	70	70
5	Right-of-Way Width (feet)	300	300	300	200	200
6	Number of Lanes	12	10	8	6	4
7	Pavement Width (feet)	4 @ 36	2 @ 36, 2 @ 24	4 @ 24	2 @ 36	2 @ 24
8	Pavement Type	High	High	High	High	High
9	Shoulder Width (feet)[3]	12	12	12	12	12
10	Shoulder Type	Paved	Paved	Paved	Paved	Paved

APPENDIX TABLE 3 (Continued)

LINE	DESIGN ITEM	COMMERCIAL ACCESS				
11	Median Width (feet)[4]	46-18	46-30	70-30	70	94
12	Min. Stopping Sight Distance (feet)	600	600	600	600	600
13	Maximum Curvature (degrees)	3.5	3.5	3.5	3.5	3.5
14	Maximum Gradient (per cent)[5]	3	3	3	3	3
15	Safe Loading	H20-S16	H20-S16	H20-S16	H20-S16	H20-S16
16	Structure Width (feet)					
17	Short Structures[6]	248	212	176	124	88
18	Long Structures[6]	248	212	176	124	88
19	Horizontal Clearance (feet)[7]	12	12	12	12	12
20	Vertical Clearance	14'-6"	14'-6"	14'-6"	14'-6"	14'-6"
21	Railroad Protection	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.

APPENDIX TABLE 3 (Continued)

LINE	DESIGN ITEM	AREA SERVICE HIGHWAY			
1	Design Standard Number	11	12	13	14
2	Traffic Volume[1]	4,200-5,600	2,800-4,200	750-2,800	Under 750
3	Access Control	None	None	None	None
4	Design Speed (mph)[2]	70	70	70	70
5	Right-of-Way Width (feet)	300	200	200	100
6	Number of Lanes	8	6	4	2
7	Pavement Width (feet)	4 @ 24	2 @ 36	2 @ 24	24
8	Pavement Type	High	High	High	High
9	Shoulder Width (feet)[3]	12	12	12	10
10	Shoulder Type	Paved	Paved	Paved	Paved
11	Median Width (feet)[4]	70-30	70	94	—
12	Min. Stopping Sight Distance (feet)	600	600	600	600
13	Maximum Curvature (degrees)	3.5	3.5	3.5	3.5
14	Maximum Gradient (per cent)[5]	3	3	3	3
15	Safe Loading	H20-S16	H20-S16	H20-S16	H20-S16
16	Structure Width (feet)				
17	Short Structures[6]	176	124	88	48
18	Long Structures[6]	176	124	88	48
19	Horizontal Clearance (feet)[7]	12	12	12	10
20	Vertical Clearance	14'-6"	14'-6"	14'-6"	14'-6"
21	Railroad Protection	Grade Sep.	Grade Sep.	[8]	[8]

Appendix Table 3 (Continued)

LINE	DESIGN ITEM	COLLECTOR HIGHWAY		
1	Design Standard Number	15	16	17
2	Traffic Volume[1]	750-3,800	400-750	Under 400
3	Access Control	None	None	None
4	Design Speed (mph)[2]	60	60	50
5	Right-of-Way Width (feet)	200	100	66
6	Number of Lanes	4	2	2
7	Pavement Width (feet)	2 @ 24	24	24
8	Pavement Type	High	High	Medium
9	Shoulder Width (feet)[3]	10	10	8
10	Shoulder Type	Sod	Sod	Sod
11	Median Width (feet)[4]	70	—	—
12	Min. Stopping Sight Distance (feet)	475	475	350
13	Maximum Curvature (degrees)	5.0	5.0	7.5
14	Maximum Gradient (per cent)[5]	3	3	4
15	Safe Loading	H20-S16	H20-S16	H20-S16
16	Structure Width (feet)			
17	Short Structures[6]	84	48	44
18	Long Structures[6]	84	48	44
19	Horizontal Clearance (feet)[7]	10	10	8
20	Vertical Clearance	14'-6"	14'-6"	14'-6"
21	Railroad Protection	[8]	[8]	[8]

Appendix Table 3 (Continued)

LINE	DESIGN ITEM	LAND ACCESS ROAD			
1	Design Standard Number	18	19	20	21
2	Traffic Volume ADT[1]	1,000 and Over	500-1,000	100-500	Under 100
3	Access Control	None	None	None	None
4	Design Speed (mph)[2]	50	40	40	40
5	Right-of-Way Width (feet)	66	50	50	50
6	Number of Lanes	2	2	2	2
7	Pavement Width (feet)	22	20	20	18
8	Pavement Type	Medium	Low	Low	Aggregate
9	Shoulder Width (feet)[3]	8	8	4	4
10	Shoulder Type	Sod	Sod	Sod	Sod
11	Median Width (feet)[4]	—	—	—	—

Appendix Table 3 (Continued)

LINE	DESIGN ITEM	LAND ACCESS ROAD			
12	Min. Stopping Sight Distance (feet)	350	275	275	275
13	Maximum Curvature (degrees)	7.5	12.5	12.5	12.5
14	Maximum Gradient (per cent)[5]	4	5	5	5
15	Safe Loading	H20-S16	H20-S16	H15-S12	H15-S12
16	Structure Width (feet)				
17	Short Structures[6]	42	40	32	30
18	Long Structures[6]	42	40	32	30
19	Horizontal Clearance (feet)[7]	8	8	6	6
20	Vertical Clearance	14'-6"	14'-6"	14'-6"	14'-6"
21	Railroad Protection	[8]	[8]	Refl. Signs	Refl. Signs

[1]Traffic volumes in terms of design hourly volumes for design standards 01-17 and average daily traffic for design standards 18-21.

[2]May be reduced by 10 mph in mountainous terrain.

[3]For divided highways inside shoulders are 4 feet for 2-lane sections and 10 feet for 3-lane sections.

[4]First value is width of center median. Second value is width of median between roadways in same direction.

[5]Maximum graces may be increased by 1 per cent for rolling terrain and 3 per cent for mountainous terrain.

[6]Separation between long and short structures: 250 feet for design standards 01-15; 150 feet for design standards 16-19; 50 feet for design standards 20 and 21.

[7]For divided highways horizontal clearances on the left side are 6 feet for 2-lane sections and 10 feet for 3-lane sections.

[8]Grade separate where ADT × Trains (min. 6) equals 100,000 or more. Flashing lights and gates for 5,000-100,000. Flashing lights for 1,500-5,000, reflectorized signs below 1,500.

APPENDIX TABLE 4

URBAN DESIGN STANDARDS FOR NEEDS ANALYSIS

New Jersey

LINE	DESIGN ITEM	CLASS I MAJOR HIGHWAY				
1	Design Standard Number	31	32	33	34	35
2	Traffic Volume – DHV	14,000-16,800	11,200-14,000	8,400-11,200	5,600-8,400	Under 5,600
3	Access Control	Full	Full	Full	Full	Full
4	Design Speed (mph)	60	60	60	60	60
5	Right-of-Way (feet)	300	300	300	200	200
6	Number of Lanes	12	10	8	6	4
7	Pavement Width (feet)	4 @ 36	2 @ 36, 2 @ 24	4 @ 24	2 @ 36	2 @ 24
8	Pavement Type	High	High	High	High	High
9	Shoulder Width (feet)[1]	12	12	12	12	12
10	Shoulder Type	Paved	Paved	Paved	Paved	Paved
11	Median Width (feet)[2]	46-18	46-30	70-30	70	94
12	Min. Stopping Sight Distance (feet)	475	475	475	475	475
13	Maximum Curvature (degrees)	5.0	5.0	5.0	5.0	5.0
14	Maximum Gradient (per cent)	3	3	3	3	3
15	Safe Loading	H20-S16	H20-S16	H20-S16	H20-S16	H20-S16
16	Structure Width (feet)					
17	Short Structures[3]	248	212	176	124	88
18	Long Structures[3]	248	212	176	124	88
19	Horizontal Clearance (feet)[4]	12	12	12	12	12
20	Vertical Clearance	14'-6"	14'-6"	14'-6"	14'-6"	14'-6"
21	Railroad Protection	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.

APPENDIX TABLE 4 (Continued)

LINE	DESIGN ITEM	PRIMARY THOROUGHFARE[5]				
1	Design Standard Number	36	37	38	39	40
2	Traffic Volume – DHV	9,000-10,800	7,200-9,000	5,400-7,200	3,600-5,400	Under 3,600
3	Access Control	Partial	Partial	Partial	Partial	Partial
4	Design Speed (mph)	50	50	50	50	50
5	Right-of-Way (feet)	300	300	300	200	200
6	Number of Lanes	12	10	8	6	4
7	Pavement Width (feet)	4 @ 36	2 @ 36, 2 @ 24	4 @ 24	2 @ 36	2 @ 24
8	Pavement Type	High	High	High	High	High
9	Shoulder Width (feet)[1]	12	12	12	12	12
10	Shoulder Type	Paved	Paved	Paved	Paved	Paved

APPENDIX TABLE 4 (Continued)

LINE	DESIGN ITEM	PRIMARY THOROUGHFARE[1]				
11	Median Width (feet)[2]	46-18	46-30	70-30	70	94
12	Min. Stopping Sight Distance (feet)	350	350	350	350	350
13	Maximum Curvature (degrees)	7.5	7.5	7.5	7.5	7.5
14	Maximum Gradient (per cent)	4	4	4	4	4
15	Safe Loading	H20-S16	H20-S16	H20-S16	H20-S16	H20-S16
16	Structure Width (feet)					
17	Short Structures[3]	248	212	176	124	88
18	Long Structures[3]	248	212	176	124	88
19	Horizontal Clearance (feet)[4]	12	12	12	12	12
20	Vertical Clearance	14'-6"	14'-6"	14'-6"	14'-6"	14'-6"
21	Railroad Protection	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.	Grade Sep.

APPENDIX TABLE 4 (Continued)

LINE	DESIGN ITEM	PRIMARY THOROUGHFARE[5]			
1	Design Standard Number	41	42	43	44
2	Traffic Volume — DHV	3,400-4,400	2,400-3,400	1,300-2,400	Under 1,300
3	Access Control	None	None	None	None
4	Design Speed (mph)	40	40	40	40
5	Right-of-Way (feet)	120	100	80	60
6	Number of Lanes	8	6	4	2
7	Pavement Width (feet)	100	76	52	30
8	Pavement Type	High	High	High	High
9	Shoulder Width (feet)[1]	—	—	—	—
10	Shoulder Type	—	—	—	—
11	Median Width (feet)[2]	—	—	—	—
12	Min. Stopping Sight Distance (feet)	275	275	275	275
13	Maximum Curvature (degrees)	12.5	12.5	12.5	12.5
14	Maximum Gradient (per cent)	5	5	5	5
15	Safe Loading	H20-S16	H20-S16	H20-S16	H20-S16
16	Structure Width (feet)				
17	Short Structures[3]	116	92	68	46
18	Long Structures[3]	116	92	68	46
19	Horizontal Clearance (feet)[4]	6	6	6	6
20	Vertical Clearance	14'-6"	14'-6"	14'-6"	14'-6"
21	Railroad Protection	[6]	[6]	[6]	[6]

APPENDIX TABLE 4 (Continued)

LINE	DESIGN ITEM	SECONDARY THOROUGHFARE[5]			
1	Design Standard Number	45	46	47	48
2	Traffic Volume – DHV	3,200-4,100	2,200-3,200	1,200-2,200	Under 1,200
3	Access Control	None	None	None	None
4	Design Speed (mph)	40	40	40	40
5	Right-of-Way (feet)	120	100	80	60
6	Number of Lanes	8	6	4	2
7	Pavement Width (feet)	100	76	52	30
8	Pavement Type	High	High	High	High
9	Shoulder Width (feet)[1]	—	—	—	—
10	Shoulder Type	—	—	—	—
11	Median Width (feet)[2]	—	—	—	—
12	Min. Stopping Sight Distance (feet)	275	275	275	275
13	Maximum Curvature (degrees)	12.5	12.5	12.5	12.5
14	Maximum Gradient (per cent)	5	5	5	5
15	Safe Loading	H20-S16	H20-S16	H20-S16	H20-S16
16	Structure Width (feet)				
17	Short Structures[3]	116	92	68	46
18	Long Structures[3]	116	92	68	46
19	Horizontal Clearance (feet)[4]	6	6	6	6
20	Vertical Clearance	14'-6"	14'-6"	14'-6"	14'-6"
21	Railroad Protection	[6]	[6]	[6]	[6]

APPENDIX TABLE 4 (Continued)

LINE	DESIGN ITEM	COMMERCIAL ACCESS			RESIDENTIAL ACCESS
1	Design Standard Number	49	50	51	52
2	Traffic Volume – DHV	1,900-2,700	1,000-1,900	Under 1,000	—
3	Access Control	None	None	None	None
4	Design Speed (mph)	—	—	—	—
5	Right-of-Way (feet)	100	80	60	60
6	Number of Lanes	6	4	2	2
7	Pavement Width (feet)	76	52	30	30
8	Pavement Type	High	High	High	Medium
9	Shoulder Width (feet)[1]	—	—	—	—
10	Shoulder Type	—	—	—	—

Appendix Table 4 (Continued)

LINE	DESIGN ITEM	COMMERCIAL ACCESS			RESIDENTIAL ACCESS
11	Median Width (feet)[2]	—	—	—	—
12	Min. Stopping Sight Distance (feet)	—	—	—	—
13	Maximum Curvature (degrees)	—	—	—	—
14	Maximum Gradient (per cent)	—	—	—	—
15	Safe Loading	H20-S16	H20-S16	H20-S16	H15-S12
16	Structure Width (feet)				
17	Short Structures[3]	92	68	46	46
18	Long Structures[3]	92	68	46	46
19	Horizontal Clearance (feet)[4]	6	6	6	6
20	Vertical Clearance	14'-6"	14'-6"	14'-6"	14'-6"
21	Railroad Protection	[7]	[7]	[7]	[8]

[1]For divided highway inside shoulders are 4 feet for 2-lane sections and 10 feet for 3-lane sections.

[2]First value is width of center median, second value is width of median between roadways in same direction.

[3]Short structures — under 50 feet. Long structures — over 50 feet.

[4]For divided highways, horizontal clearances on the left side are 6 feet for 2-lane sections and 10 feet for 3-lane sections.

[5]For Class II Major Highway extensions, use design standard numbers 36-40 or 41-44, whichever are applicable. For Area Service extensions, use design standard numbers 41-44. For Collector Highway extensions, use design standard numbers 41-44 or 45-48, whichever are applicable.

[6]Grade separate where ADT × Trains (min. 6) equals 200,000 or more. Flashing lights and gates for 5,000-200,000. Flashing lights for under 5,000.

[7]Flashing lights and gates.

[8]Flashing lights.

Appendix Table 5

AVERAGE ANNUAL NEEDS BY FUNCTIONAL CLASSIFICATION AND BY COST ITEM FOR 10, 15, AND 20-YEAR PROGRAMS

Existing State Highway System

New Jersey

1967-1986

FUNCTIONAL CLASSIFICATION AND COST ITEM	10-YEAR PROGRAM		15-YEAR PROGRAM		20-YEAR PROGRAM
	1967-1976	1977-1986	1967-1981	1982-1986	
			(thousands)		
Interstate — Rural					
Construction					
Identified	$ 18,419.4	$ —	$ 12,279.6	$ —	$ 9,209.7
Replacement	62.1	470.3	198.2	470.3	266.2
Maintenance	1,444.5	2,238.7	1,709.2	2,238.7	1,841.6
Administration	2,191.9	298.0	1,560.6	298.0	1,245.0
TOTAL	$ 22,117.9	$ 3,007.0	$ 15,747.6	$ 3,007.0	$ 12,562.5
Less Federal Share of Construction	16,577.5	—	11,051.7	—	8,288.8
Net State Share	$ 5,540.4	$ 3,007.0	$ 4,695.9	$ 3,007.0	$ 4,273.7
Interstate — Urban					
Construction					
Identified	$ 63,052.3	$ —	$ 42,034.9	$ —	$ 31,526.2
Replacement	188.1	1,209.0	528.4	1,209.0	698.5
Maintenance	2,651.3	3,911.3	3,071.3	3,911.3	3,281.3
Administration	7,248.1	563.2	5,019.8	563.2	3,905.6
TOTAL	$ 73,139.8	$ 5,683.5	$ 50,654.4	$ 5,683.5	$ 39,411.6
Less Federal Share of Construction	56,747.1	—	37,831.4	—	28,373.5
Net State Share	$ 16,392.7	$ 5,683.5	$ 12,823.0	$ 5,683.5	$ 11,038.1
Class I Major — Rural					
Construction					
Identified	$ 7,667.7	$ 16,242.7	$ 11,184.9	$ 14,266.2	$ 11,955.2
Replacement	22.2	225.0	93.0	420.8	189.4
Maintenance	326.3	1,276.2	721.5	1,671.4	1,019.9
Administration	881.8	1,951.8	1,319.9	1,799.4	1,448.1
TOTAL	$ 8,898.0	$ 19,695.7	$ 13,319.3	$ 18,157.8	$ 14,612.6

APPENDIX TABLE 5 (Continued)

FUNCTIONAL CLASSIFICATION AND COST ITEM	10-YEAR PROGRAM 1967-1976	10-YEAR PROGRAM 1977-1986	15-YEAR PROGRAM 1967-1981	15-YEAR PROGRAM 1982-1986	20-YEAR PROGRAM
			(thousands)		
Class I Major — Urban					
Construction					
Identified	$116,423.2	$ 31,511.8	$ 91,241.4	$ 22,145.8	$ 73,967.5
Stopgap	1,524.8	—	1,863.7	—	2,033.1
Replacement	155.9	1,218.7	333.5	1,466.9	513.4
Maintenance	2,379.9	4,493.8	2,762.5	4,876.4	2,993.6
Administration	13,253.2	4,094.7	10,582.1	3,133.8	8,745.8
TOTAL	$133,737.0	$ 41,319.0	$106,783.2	$ 31,622.9	$ 88,253.4
Class II Major — Rural					
Construction					
Identified	$ 8,509.4	$ 6,207.0	$ 7,803.9	$ 6,021.2	$ 7,358.2
Stopgap	202.4	—	247.4	—	269.9
Replacement	56.2	450.3	118.5	528.4	194.1
Maintenance	1,928.0	2,419.0	2,136.8	2,627.7	2,306.9
Administration	1,176.6	998.4	1,133.7	1,009.5	1,114.2
TOTAL	$ 11,872.6	$ 10,074.7	$ 11,440.3	$ 10,186.8	$ 11,243.3
Class II Major — Urban					
Construction					
Identified	$ 54,967.2	$ 8,473.4	$ 40,289.7	$ 6,012.0	$ 31,720.3
Stopgap	1,102.5	—	1,347.4	—	1,469.9
Replacement	224.9	1,682.3	477.6	2,022.4	750.1
Maintenance	4,631.5	6,078.1	4,903.9	6,350.5	5,109.9
Administration	6,701.9	1,785.7	5,172.0	1,582.3	4,295.5
TOTAL	$ 67,628.0	$ 18,019.5	$ 52,190.6	$ 15,967.2	$ 43,345.7
Area Service — Rural					
Construction					
Identified	$ 9,328.2	$ 7,665.8	$ 7,850.2	$ 10,437.4	$ 8,497.0
Stopgap	201.4	—	246.1	—	268.5
Replacement	78.8	671.3	191.8	864.0	367.6
Maintenance	3,371.8	4,531.1	3,629.6	4,789.0	3,992.7
Administration	1,427.8	1,415.5	1,311.0	1,769.9	1,443.8
TOTAL	$ 14,408.0	$ 14,283.7	$ 13,228.7	$ 17,860.3	$ 14,569.6

APPENDIX TABLE 5 (Continued)

FUNCTIONAL CLASSIFICATION AND COST ITEM	10-YEAR PROGRAM 1967-1976	10-YEAR PROGRAM 1977-1986	15-YEAR PROGRAM 1967-1981	15-YEAR PROGRAM 1982-1986	20-YEAR PROGRAM
			(thousands)		
Area Service — Urban					
Construction					
Identified	$ 22,275.6	$ 4,205.2	$ 16,198.8	$ 4,365.2	$ 13,240.4
Stopgap	343.0	—	419.3	—	457.4
Replacement	152.5	1,240.8	349.8	1,559.9	571.6
Maintenance	5,440.2	7,069.0	5,779.7	7,408.5	5,971.7
Administration	3,103.2	1,376.7	2,502.2	1,466.7	2,226.5
TOTAL	$ 31,314.5	$ 13,891.7	$ 25,249.8	$ 14,800.3	$ 22,467.6
Collector — Rural					
Construction					
Identified	$ 4,611.2	$ 905.7	$ 3,196.3	$ 1,445.0	$ 2,758.4
Stopgap	130.9	—	160.0	—	174.5
Replacement	43.8	349.3	89.4	398.8	147.8
Maintenance	1,428.1	1,764.3	1,474.6	1,810.8	1,526.7
Administration	497.1	241.5	393.6	292.4	368.6
TOTAL	$ 6,711.1	$ 3,260.8	$ 5,313.9	$ 3,947.0	$ 4,976.0
Collector — Urban					
Construction					
Identified	$ 9,276.3	$ 1,574.0	$ 6,886.3	$ 1,041.6	$ 5,425.1
Stopgap	220.3	—	269.2	—	293.7
Replacement	81.6	664.3	192.8	858.4	306.2
Maintenance	2,595.3	3,513.4	2,841.6	3,759.7	2,952.5
Administration	973.9	460.1	815.2	452.8	718.2
TOTAL	$ 13,147.4	$ 6,211.8	$ 11,005.1	$ 6,112.5	$ 9,695.7
Land Access					
Construction					
Identified	$ 33.1	$ —	$ 22.1	$ —	$ 16.5
Stopgap	1.4	—	1.7	—	1.9
Replacement	.1	.9	.2	.9	.3
Maintenance	6.3	5.5	6.3	5.5	6.3
Administration	3.3	.5	2.4	.5	2.0
TOTAL	$ 44.2	$ 6.9	$ 32.7	$ 6.9	$ 27.0

APPENDIX TABLE 5 (Continued)

FUNCTIONAL CLASSIFICATION AND COST ITEM	10-YEAR PROGRAM 1967-1976	10-YEAR PROGRAM 1977-1986	15-YEAR PROGRAM 1967-1981	15-YEAR PROGRAM 1982-1986	20-YEAR PROGRAM
			(thousands)		
Primary Thoroughfare					
Construction					
Identified	$ 869.7	$ 534.7	$ 694.9	$ 724.2	$ 702.2
Stopgap	10.0	—	12.2	—	13.3
Replacement	6.2	52.1	14.5	65.2	27.9
Maintenance	270.4	344.4	284.6	358.6	304.6
Administration	80.9	65.2	70.4	80.4	73.4
TOTAL	$ 1,237.2	$ 996.4	$ 1,076.6	$ 1,228.4	$ 1,121.4
Secondary Thoroughfare					
Construction					
Identified	$ 211.9	$ 27.4	$ 149.9	$ 28.8	$ 119.6
Stopgap	6.7	—	8.2	—	9.0
Replacement	1.0	8.4	2.0	9.1	4.2
Maintenance	40.6	49.2	41.4	50.0	43.6
Administration	18.2	5.9	14.1	6.2	12.4
TOTAL	$ 278.4	$ 90.9	$ 215.6	$ 94.1	$ 188.8
Residential Street					
Construction					
Identified	$ —	$ —	$ —	$ —	$ —
Stopgap	—	—	—	—	—
Replacement	—	—	—	—	—
Maintenance	7.0	7.0	7.0	7.0	7.0
Administration	.5	.5	.5	.5	.5
TOTAL	$ 7.5	$ 7.5	$ 7.5	$ 7.5	$ 7.5
TOTAL STATE SYSTEM	$311,217.0	$136,549.1	$257,382.2	$128,682.2	$225,820.4

APPENDIX TABLE 6

AVERAGE ANNUAL NEEDS BY FUNCTIONAL CLASSIFICATION AND BY COST ITEM FOR 10, 15, AND 20-YEAR PROGRAMS

Existing County Highway System

New Jersey

1967-1986

FUNCTIONAL CLASSIFICATION AND COST ITEM	*10-YEAR PROGRAM*		*15-YEAR PROGRAM*		*20-YEAR PROGRAM*
	1967-1976	*1977-1986*	*1967-1981*	*1982-1986*	
			(thousands)		
Class II Major – Rural					
Construction					
Identified	$ 1,449.2	$ 26.0	$ 966.1	$ 52.0	$ 737.6
Stopgap	38.3	—	46.8	—	51.1
Replacement	9.6	72.7	16.3	72.2	23.0
Maintenance	307.8	310.8	307.8	310.8	307.8
Administration	198.5	45.0	147.1	47.8	123.1
TOTAL	$ 2,003.4	$ 454.5	$ 1,484.1	$ 482.8	$ 1,242.6
Class II Major – Urban					
Construction					
Identified	$ 345.4	$ 537.4	$ 379.7	$ 626.6	$ 441.4
Stopgap	1.8	—	2.2	—	2.4
Replacement	.7	6.4	1.8	8.3	4.2
Maintenance	31.1	43.7	33.9	46.6	39.6
Administration	41.7	64.6	45.9	75.0	53.6
TOTAL	$ 420.7	$ 652.1	$ 463.5	$ 756.5	$ 541.2
Area Service – Rural					
Construction					
Identified	$ 572.9	$ 144.5	$ 409.6	$ 206.0	$ 358.7
Stopgap	10.3	—	12.6	—	13.8
Replacement	14.3	109.0	25.0	110.9	36.7
Maintenance	477.0	562.8	479.4	565.2	484.0
Administration	118.2	89.8	101.9	97.0	98.2
TOTAL	$ 1,192.7	$ 906.1	$ 1,028.5	$ 979.1	$ 991.4

APPENDIX TABLE 6 (Continued)

FUNCTIONAL CLASSIFICATION AND COST ITEM	10-YEAR PROGRAM 1967-1976	10-YEAR PROGRAM 1977-1986	15-YEAR PROGRAM 1967-1981	15-YEAR PROGRAM 1982-1986	20-YEAR PROGRAM
			(thousands)		
Area Service — Urban					
Construction					
Identified	$ 930.4	$ 416.9	$ 787.8	$ 331.2	$ 673.6
Stopgap	9.2	—	11.3	—	12.3
Replacement	6.5	56.0	17.8	79.6	31.2
Maintenance	383.8	478.3	409.9	504.4	426.0
Administration	146.3	104.6	134.9	100.7	125.7
TOTAL	$ 1,476.2	$ 1,055.8	$ 1,361.7	$ 1,015.9	$ 1,268.8
Collector — Rural					
Construction					
Identified	$11,709.2	$ 1,646.2	$ 8,136.2	$ 2,302.2	$ 6,677.7
Stopgap	371.1	—	453.6	—	494.8
Replacement	165.2	1,233.5	298.6	1,294.6	442.0
Maintenance	7,238.8	7,918.8	7,280.1	7,960.1	7,303.9
Administration	1,558.7	863.9	1,293.5	924.6	1,193.5
TOTAL	$21,043.0	$11,662.4	$17,462.0	$12,481.5	$16,111.9
Collector — Urban					
Construction					
Identified	$16,886.1	$ 5,458.6	$13,164.8	$ 5,195.0	$11,172.3
Stopgap	330.3	—	403.7	—	440.4
Replacement	161.1	1,359.4	408.6	1,830.5	719.5
Maintenance	10,015.3	11,994.6	10,532.3	12,511.6	10,896.3
Administration	2,191.4	1,505.0	1,960.7	1,563.0	1,858.3
TOTAL	$29,584.2	$20,317.6	$26,470.1	$21,100.1	$25,086.8
Primary Thoroughfare					
Construction					
Identified	$ 3,502.5	$ 1,823.9	$ 2,966.7	$ 1,752.8	$ 2,663.2
Stopgap	42.7	—	52.2	—	57.0
Replacement	46.1	383.8	95.6	432.3	193.7
Maintenance	2,157.9	2,662.2	2,225.5	2,729.8	2,400.7
Administration	402.4	340.9	373.8	344.0	372.0
TOTAL	$ 6,151.6	$ 5,210.8	$ 5,713.8	$ 5,258.9	$ 5,686.6

APPENDIX TABLE 6 (Continued)

FUNCTIONAL CLASSIFICATION AND COST ITEM	10-YEAR PROGRAM 1967-1976	10-YEAR PROGRAM 1977-1986	15-YEAR PROGRAM 1967-1981	15-YEAR PROGRAM 1982-1986	20-YEAR PROGRAM
			(thousands)		
Secondary Thoroughfare Construction					
Identified	$ 3,675.5	$ 977.4	$ 2,712.0	$ 1,169.8	$ 2,326.4
Stopgap	63.2	—	77.3	—	84.3
Replacement	53.9	437.3	104.5	470.2	198.2
Maintenance	3,902.3	4,141.0	3,935.5	4,174.3	3,982.1
Administration	538.6	388.9	478.0	407.0	461.4
TOTAL	$ 8,233.5	$ 5,944.6	$ 7,307.3	$ 6,221.3	$ 7,052.4
Land Access Construction	$ 4,115.2	$ 4,115.2	$ 4,115.2	$ 4,115.2	$ 4,115.2
Maintenance	5,663.2	5,663.2	5,663.2	5,663.2	5,663.2
Administration	782.3	782.3	782.3	782.3	782.3
TOTAL	$10,560.7	$10,560.7	$10,560.7	$10,560.7	$10,560.7
Commercial Construction	$ 103.2	$ 103.2	$ 103.2	$ 103.2	$ 103.2
Maintenance	90.0	90.0	90.0	90.0	90.0
Administration	15.4	15.4	15.4	15.4	15.4
TOTAL	$ 208.6	$ 208.6	$ 208.6	$ 208.6	$ 208.6
Residential Construction	$ 3,535.6	$ 3,535.6	$ 3,535.6	$ 3,535.6	$ 3,535.6
Maintenance	4,650.9	4,650.9	4,650.9	4,650.9	4,650.9
Administration	654.9	654.9	654.9	654.9	654.9
TOTAL	$ 8,841.4	$ 8,841.4	$ 8,841.4	$ 8,841.4	$ 8,841.4
TOTAL COUNTY SYSTEM	$89,716.0	$65,814.6	$80,901.7	$67,906.8	$77,592.4

Appendix Table 7

AVERAGE ANNUAL NEEDS BY FUNCTIONAL CLASSIFICATION AND BY COST ITEM FOR 10, 15, AND 20-YEAR PROGRAMS

Existing Municipal Street System
New Jersey
1967-1986

FUNCTIONAL CLASSIFICATION AND COST ITEM	*10-YEAR PROGRAM*		*15-YEAR PROGRAM*		*20-YEAR PROGRAM*
	1967-1976	*1977-1986*	*1967-1981*	*1982-1986*	
			(thousands)		
Class II Major — Urban					
Construction					
Identified	$ 709.3	$ —	$ 472.9	$ —	$ 354.6
Stopgap	19.6	—	24.0	—	26.2
Replacement	2.5	18.7	4.2	18.6	5.9
Maintenance	42.2	63.6	42.2	63.6	42.2
Administration	85.1	9.1	59.8	9.0	47.2
TOTAL	$ 858.7	$ 91.4	$ 603.1	$ 91.2	$ 476.1
Area Service — Urban					
Construction					
Identified	$ 145.7	$ 34.4	$ 118.0	$ 6.2	$ 90.0
Stopgap	1.8	—	2.2	—	2.5
Replacement	1.9	14.5	3.4	15.0	5.5
Maintenance	62.0	84.7	63.1	85.8	65.7
Administration	23.3	14.7	20.5	11.8	18.0
TOTAL	$ 234.7	$ 148.3	$ 207.2	$ 118.8	$ 181.7
Collector — Rural					
Construction					
Identified	$ 832.2	$ 14.0	$ 554.8	$ 28.0	$ 423.1
Stopgap	28.7	—	35.0	—	38.2
Replacement	14.2	102.6	23.7	101.3	33.5
Maintenance	362.9	420.0	362.9	420.0	363.1
Administration	99.0	42.9	78.1	43.9	68.6
TOTAL	$ 1,337.0	$ 579.5	$ 1,054.5	$ 593.2	$ 926.5
Collector — Urban					
Construction					
Identified	$ 1,250.3	$ 308.3	$ 1,006.8	$ 96.8	$ 779.3
Stopgap	25.1	—	30.7	—	33.5
Replacement	19.7	161.2	50.6	224.8	76.5
Maintenance	1,244.4	1,440.8	1,309.4	1,505.8	1,319.5
Administration	203.2	152.8	191.8	146.2	176.7
TOTAL	$ 2,742.7	$ 2,063.1	$ 2,589.3	$ 1,973.6	$ 2,385.5

APPENDIX TABLE 7 (Continued)

FUNCTIONAL CLASSIFICATION AND COST ITEM	10-YEAR PROGRAM 1967-1976	10-YEAR PROGRAM 1977-1986	15-YEAR PROGRAM 1967-1981	15-YEAR PROGRAM 1982-1986	20-YEAR PROGRAM
			(thousands)		
Land Access					
Construction	$ 21,431.3	$ 21,431.3	$ 21,431.3	$ 21,431.3	$ 21,431.3
Maintenance	25,186.4	25,186.4	25,186.4	25,186.4	25,186.4
Administration	3,263.2	3,263.2	3,263.2	3,263.2	3,263.2
TOTAL	$ 49,880.9	$ 49,880.9	$ 49,880.9	$ 49,880.9	$ 49,880.9
Primary Thoroughfare					
Construction					
Identified	$ 1,473.0	$ 74,511.9	$ 28,608.3	$ 66,145.0	$ 37,992.4
Stopgap	31.9	—	39.0	—	42.6
Replacement	18.0	359.5	211.0	978.4	576.7
Maintenance	991.1	4,773.8	2,798.0	6,580.7	4,666.9
Administration	176.0	5,575.2	2,215.9	5,159.3	3,029.5
TOTAL	$ 2,690.0	$ 85,220.4	$ 33,872.2	$ 78,863.4	$ 46,308.1
Secondary Thoroughfare					
Construction					
Identified	$ 7,516.8	$ 1,226.9	$ 5,044.2	$ 2,354.8	$ 4,371.8
Stopgap	105.5	—	128.9	—	140.6
Replacement	180.1	1,417.4	310.6	1,393.3	559.3
Maintenance	8,318.8	8,891.7	8,322.6	8,895.5	8,444.7
Administration	1,128.5	807.5	966.4	885.1	946.1
TOTAL	$ 17,249.7	$ 12,343.5	$ 14,772.7	$ 13,528.7	$ 14,462.5
Commercial					
Construction	$ 6,129.4	$ 6,129.4	$ 6,129.4	$ 6,129.4	$ 6,129.4
Maintenance	5,469.9	5,469.9	5,469.9	5,469.9	5,469.9
Administration	811.9	811.9	811.9	811.9	811.9
TOTAL	$ 12,411.2	$ 12,411.2	$ 12,411.2	$ 12,411.2	$ 12,411.2
Residential					
Construction	$ 48,181.5	$ 48,181.5	$ 48,181.5	$ 48,181.5	$ 48,181.5
Maintenance	64,049.9	64,049.9	64,049.9	64,049.9	64,049.9
Administration	7,856.2	7,856.2	7,856.2	7,856.2	7,856.2
TOTAL	$120,087.6	$120,087.6	$120,087.6	$120,087.6	$120,087.6
TOTAL MUNICIPAL SYSTEM	$207,492.5	$282,825.9	$235,478.7	$277,548.6	$247,120.1

APPENDIX TABLE 8

AVERAGE ANNUAL NEEDS BY FUNCTIONAL CLASSIFICATION AND BY COST ITEM FOR 10, 15, AND 20-YEAR PROGRAMS
Recommended State Highway System
New Jersey
1967-1986

FUNCTIONAL CLASSIFICATION AND COST ITEM	10-YEAR PROGRAM 1967-1976	10-YEAR PROGRAM 1977-1986	15-YEAR PROGRAM 1967-1981	15-YEAR PROGRAM 1982-1986	20-YEAR PROGRAM
			(thousands)		
Interstate — Rural					
Construction					
Identified	$ 18,419.4	$ —	$ 12,279.6	$ —	$ 9,209.7
Replacement	62.1	470.3	198.2	470.3	266.2
Maintenance	1,444.5	2,238.7	1,709.2	2,238.7	1,841.6
Administration	2,191.9	298.0	1,560.6	298.0	1,245.0
TOTAL	$ 22,117.9	$ 3,007.0	$ 15,747.6	$ 3,007.0	$ 12,562.5
Less Federal Share of Construction	16,577.5	—	11,051.7	—	8,288.8
Net State Share	$ 5,540.4	$ 3,007.0	$ 4,695.9	$ 3,007.0	$ 4,273.7
Interstate — Urban					
Construction					
Identified	$ 63,052.3	$ —	$ 42,034.9	$ —	$ 31,526.2
Replacement	188.1	1,209.0	528.4	1,209.0	698.5
Maintenance	2,651.3	3,911.3	3,071.3	3,911.3	3,281.3
Administration	7,248.1	563.2	5,019.8	563.2	3,905.6
TOTAL	$ 73,139.8	$ 5,683.5	$ 50,654.4	$ 5,683.5	$ 39,411.6
Less Federal Share of Construction	56,747.1	—	37,831.4	—	28,373.5
Net State Share	$ 16,392.7	$ 5,683.5	$ 12,823.0	$ 5,683.5	$ 11,038.1
Class I Major — Rural					
Construction					
Identified	$ 7,667.7	$ 16,242.7	$ 11,184.9	$ 14,266.2	$ 11,955.2
Replacement	22.2	225.0	93.0	420.8	189.4
Maintenance	326.3	1,276.2	721.5	1,671.4	1,019.9
Administration	881.8	1,951.8	1,319.9	1,799.4	1,448.1
TOTAL	$ 8,898.0	$ 19,695.7	$ 13,319.3	$ 18,157.8	$ 14,612.6
Class I Major — Urban					
Construction					
Identified	$116,423.2	$ 31,511.8	$ 91,241.4	$ 22,145.8	$ 73,967.5
Stopgap	1,524.8	—	1,863.7	—	2,033.1
Replacement	155.9	1,218.7	333.5	1,466.9	513.4
Maintenance	2,379.9	4,493.8	2,762.5	4,876.4	2,993.6
Administration	13,253.2	4,094.7	10,582.1	3,133.8	8,745.8
TOTAL	$133,737.0	$ 41,319.0	$106,783.2	$ 31,622.9	$ 88,253.4

APPENDIX TABLE 8 (Continued)

FUNCTIONAL CLASSIFICATION AND COST ITEM	10-YEAR PROGRAM 1967-1976	10-YEAR PROGRAM 1977-1986	15-YEAR PROGRAM 1967-1981	15-YEAR PROGRAM 1982-1986	20-YEAR PROGRAM
			(thousands)		
Class II Major — Rural					
Construction					
Identified	$ 9,958.6	$ 6,233.0	$ 8,770.0	$ 6,073.2	$ 8,095.8
Stopgap	240.7	—	294.2	—	321.0
Replacement	65.8	523.0	134.8	600.6	217.1
Maintenance	2,235.8	2,729.8	2,444.6	2,938.5	2,614.7
Administration	1,375.1	1,043.4	1,280.8	1,057.3	1,237.3
TOTAL	$ 13,876.0	$ 10,529.2	$ 12,924.4	$ 10,669.6	$ 12,485.9
Class II Major — Urban					
Construction					
Identified	$ 56,021.9	$ 9,010.8	$ 41,142.3	$ 6,638.6	$ 32,516.3
Stopgap	1,123.9	—	1,373.6	—	1,498.5
Replacement	228.1	1,707.4	483.6	2,049.3	760.2
Maintenance	4,704.8	6,185.4	4,980.0	6,460.7	5,191.7
Administration	6,828.7	1,859.4	5,277.7	1,666.3	4,396.3
TOTAL	$ 68,907.4	$ 18,763.0	$ 53,257.2	$ 16,814.9	$ 44,363.0
Area Service — Rural					
Construction					
Identified	$ 9,901.1	$ 7,810.3	$ 8,259.8	$ 10,643.4	$ 8,855.7
Stopgap	211.7	—	258.7	—	282.3
Replacement	93.1	780.3	216.8	974.9	404.3
Maintenance	3,848.8	5,093.9	4,109.0	5,354.2	4,476.7
Administration	1,546.0	1,505.3	1,412.9	1,866.9	1,542.0
TOTAL	$ 15,600.7	$ 15,189.8	$ 14,257.2	$ 18,839.4	$ 15,561.0
Area Service — Urban					
Construction					
Identified	$ 23,351.7	$ 4,656.5	$ 17,104.6	$ 4,702.6	$ 14,004.0
Stopgap	354.0	—	432.8	—	472.2
Replacement	160.9	1,311.3	371.0	1,654.5	608.3
Maintenance	5,886.0	7,632.0	6,252.7	7,998.7	6,463.4
Administration	3,272.8	1,496.0	2,657.6	1,579.2	2,370.2
TOTAL	$ 33,025.4	$ 15,095.8	$ 26,818.7	$ 15,935.0	$ 23,918.1
TOTAL STATE SYSTEM	$295,977.6	$129,283.0	$244,878.9	$120,730.1	$214,505.8

Appendix Table 9

AVERAGE ANNUAL NEEDS BY FUNCTIONAL CLASSIFICATION AND BY COST ITEM FOR 10, 15, AND 20-YEAR PROGRAMS

Recommended County Highway System

New Jersey

1967-1986

FUNCTIONAL CLASSIFICATION AND COST ITEM	*10-YEAR PROGRAM*		*15-YEAR PROGRAM*		*20-YEAR PROGRAM*
	1967-1976	*1977-1986*	*1967-1981*	*1982-1986*	
			(thousands)		
Collector — Rural					
Construction					
Identified	$17,152.6	$ 2,565.9	$11,887.3	$ 3,775.2	$ 9,859.2
Stopgap	530.7	—	648.6	—	707.5
Replacement	223.2	1,685.4	411.7	1,794.7	623.3
Maintenance	9,029.8	10,103.1	9,117.6	10,190.9	9,193.7
Administration	2,154.8	1,148.3	1,765.2	1,260.9	1,630.7
TOTAL	$29,091.1	$15,502.7	$23,830.4	$17,021.7	$22,014.4
Collector — Urban					
Construction					
Identified	$27,412.7	$ 7,340.9	$21,057.9	$ 6,333.4	$17,376.7
Stopgap	575.7	—	703.6	—	767.6
Replacement	262.4	2,184.9	652.0	2,913.7	1,102.2
Maintenance	13,855.0	16,948.8	14,683.3	17,777.1	15,168.3
Administration	3,368.5	2,117.9	2,967.7	2,162.0	2,753.2
TOTAL	$45,474.3	$28,592.5	$40,134.5	$29,186.2	$37,168.0
TOTAL COUNTY SYSTEM	$74,565.4	$44,095.2	$63,894.9	$46,207.9	$59,182.4

Appendix Table 10

AVERAGE ANNUAL NEEDS BY FUNCTIONAL CLASSIFICATION AND BY COST ITEM FOR 10, 15, AND 20-YEAR PROGRAMS

Recommended Municipal System

New Jersey

1967-1986

FUNCTIONAL CLASSIFICATION AND COST ITEM	*10-YEAR PROGRAM*		*15-YEAR PROGRAM*		*20-YEAR PROGRAM*
	1967-1976	*1977-1986*	*1967-1981*	*1982-1986*	
			(thousands)		
Land Access					
Construction	$ 25,581.1	$ 25,547.4	$ 25,570.5	$ 25,547.4	$ 25,565.2
Maintenance	30,855.9	30,855.1	30,855.9	30,855.1	30,855.9
Administration	4,048.8	4,046.0	4,047.9	4,046.0	4,047.5
TOTAL	$ 60,485.8	$ 60,448.5	$ 60,474.3	$ 60,448.5	$ 60,468.6
Primary Thoroughfare					
Construction					
Identified	$ 5,845.2	$ 76,870.5	$ 32,269.9	$ 68,622.0	$ 41,357.8
Stopgap	84.6	—	103.4	—	112.9
Replacement	70.3	795.4	321.1	1,475.9	798.3
Maintenance	3,419.4	7,780.4	5,308.1	9,669.1	7,372.2
Administration	659.3	5,981.3	2,660.1	5,583.7	3,474.9
TOTAL	$ 10,078.8	$ 91,427.6	$ 40,662.6	$ 85,350.7	$ 53,116.1
Secondary Thoroughfare					
Construction					
Identified	$ 11,404.2	$ 2,231.7	$ 7,906.1	$ 3,553.4	$ 6,817.8
Stopgap	175.4	—	214.4	—	233.9
Replacement	235.0	1,863.1	417.1	1,872.6	761.7
Maintenance	12,261.7	13,081.9	12,299.5	13,119.8	12,470.4
Administration	1,685.3	1,202.3	1,458.5	1,298.3	1,419.9
TOTAL	$ 25,761.6	$ 18,379.0	$ 22,295.6	$ 19,844.1	$ 21,703.7
Commercial					
Construction	$ 6,232.6	$ 6,232.6	$ 6,232.6	$ 6,232.6	$ 6,232.6
Maintenance	5,559.9	5,559.9	5,559.9	5,559.9	5,559.9
Administration	827.3	827.3	827.3	827.3	827.3
TOTAL	$ 12,619.8	$ 12,619.8	$ 12,619.8	$ 12,619.8	$ 12,619.8
Residential					
Construction	$ 51,717.1	$ 51,717.1	$ 51,717.1	$ 51,717.1	$ 51,717.1
Maintenance	68,707.8	68,707.8	68,707.8	68,707.8	68,707.8
Administration	8,511.6	8,511.6	8,511.6	8,511.6	8,511.6
TOTAL	$128,936.5	$128,936.5	$128,936.5	$128,936.5	$128,936.5
TOTAL MUNICIPAL SYSTEM	$237,882.5	$311,811.4	$264,988.8	$307,199.6	$276,844.7

Appendix Table 11

ALLOCATION OF HIGHWAY-USER STATE TAX RESPONSIBILITY

Annual Rates Per Vehicle

New Jersey

1967-1986

REGISTRATION CLASS	INCREMENTAL	COST-FUNCTION	VEHICLE-MILE (dollars)	TON-MILE	COMPROMISE[1]
Passenger Cars	66	74	85	59	72
Buses	1,228	670	282	1,147	715
Trucks[2]					
2-6	72	79	81	75	78
6-10	102	103	91	113	102
10-16	166	143	105	180	143
16-22	272	205	124	291	207
22-28	423	280	145	427	286
28-36	621	365	168	594	381
36-44	603	453	198	784	491
44-52	704	559	232	1,005	619
52-60	982	732	275	1,374	824
60-68	1,296	915	314	1,792	1,053
68-72	1,259	977	318	1,960	1,139

[1]Average of vehicle-mile and ton-mile allocations.
[2]Gross weight in thousands of pounds.

Appendix Table 12

ALLOCATION OF HIGHWAY-USER STATE TAX RESPONSIBILITY

Rates Per Vehicle-Mile

New Jersey

1967-1986

REGISTRATION CLASS	*INCREMENTAL*	*COST-FUNCTION*	*VEHICLE-MILE*	*TON-MILE*	*COMPROMISE*[1]
			(cents)		
Passenger Cars	0.63	0.71	0.82	0.57	0.69
Buses	3.41	1.86	0.78	3.18	1.98
Trucks[2]					
2-6	0.74	0.81	0.83	0.77	0.80
6-10	0.91	0.93	0.82	1.02	0.92
10-16	1.22	1.04	0.77	1.32	1.05
16-22	1.67	1.26	0.76	1.79	1.27
22-28	2.19	1.45	0.75	2.21	1.48
28-36	2.68	1.58	0.72	2.56	1.64
36-44	2.10	1.58	0.69	2.73	1.71
44-52	1.99	1.58	0.65	2.84	1.74
52-60	2.31	1.72	0.65	3.23	1.94
60-68	2.62	1.85	0.64	3.63	2.13
68-72	2.35	1.82	0.59	3.66	2.13

[1]Average of vehicle-mile and ton-mile allocations.
[2]Gross weight in thousands of pounds.

Appendix Table 13

ALLOCATION OF HIGHWAY-USER STATE TAX RESPONSIBILITY

Rates Per Ton-Mile

New Jersey

1967-1986

REGISTRATION CLASS	*INCREMENTAL*	*FUNCTION COST-*	*VEHICLE-MILE* (*mills*)	*TON-MILE*	*COMPROMISE*[1]
Passenger Cars	3.43	3.83	4.41	3.08	3.74
Buses	3.25	1.77	0.75	3.03	1.89
Trucks[2]					
2-6	3.08	3.39	3.46	3.21	3.34
6-10	2.81	2.86	2.52	3.14	2.83
10-16	2.59	2.22	1.64	2.81	2.22
16-22	2.57	1.94	1.17	2.75	1.96
22-28	2.64	1.75	0.90	2.67	1.79
28-36	2.57	1.52	0.70	2.47	1.58
36-44	1.65	1.24	0.54	2.14	1.34
44-52	1.32	1.05	0.43	1.88	1.16
52-60	1.31	0.97	0.37	1.83	1.10
60-68	1.27	0.90	0.31	1.75	1.03
68-72	1.00	0.78	0.25	1.56	0.90

[1]Average of vehicle-mile and ton-mile allocations.
[2]Gross weight in thousands of pounds.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